U. S. NAVAL ACADEMY,

September 9, 1876.

ORDER, No. 99.

All officers attached to the Naval Academy will wear the prescribed uniform from the 15th inst.

Unless otherwise ordered, the Academic Coat will be worn on week days. On Sundays, the frock coat will be worn until 2 o'clock, after which, the Academic Coat may be worn, if preferred.

After the 20th inst., blue caps and blue trowsers will be worn.

Plain clothes can only be worn within the limits of the Academy, when officers shall be passing to and from the town, by the direct route from their quarters to the gates.

C. R. P. RODGERS,
Rear-Admiral, Superintendent.

ANNAPOLIS, MD.

U. S. NAVAL ACADEMY,

November 29, 1876.

In order that there may be uniformity of dress at the entertainments given at the Naval Academy, it is desired that so far as may be possible, the officers shall wear at,

Officers' Matinees, Undress Coat, plain Trowsers.

Cadet Hops. Social Intercourse Coat, plain Trowsers.

Thanksgiving, Christmas, and *New Year's Eve Hops.* Social Intercourse Coat, Epaulettes, plain Trowsers.

January and June Balls. Social Intercourse Coats, Epaulettes, and gold laced Trowsers.

By desire of Rear-Admiral, Superintendent.

N. H. FARQUHAR.
Comd'r and Senior Aid.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1876.

ANNUAL REGISTER

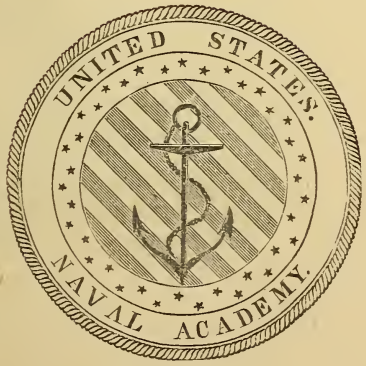
OF THE

TED STATES NAVAL ACADEMY,

ANNAPOLIS, MD.

TWENTY-SEVENTH ACADEMIC YEAR,

1876-77.



WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1876.

OFFICERS' DIRECTORY.

U. S. NAVAL ACADEMY,

October 18, 1876.

Rear-Admiral C. R. P. RODGERS, *Superintendent.*

Commander Edward Terry,	No. 1.	Officer's Quarters.
" J. A. Howell,	" 6,	do.
" H. L. Howison,	" 4,	do.
" N. H. Farquhar,	" 3,	do.
" James O'Kane,	" 9,	do.
" W. T. Sampson,	" 11,	do.
Lieut. Comd'r S. W. Terry,	" 25,	do.
" M. Miller, U. S. Ship	"Santee."	
" A. D. Brown,	No. 15,	2d floor Officer's quarters.
" C. M. Chester,	" 18,	Officer's quarters.
" C. V. Gridley,	" 14,	2d floor Officer's quarters.
" C. W. Kennedy,	" 17,	Officer's quarters.
" B. H. McCalla,	" 20,	do.
" S. H. Baker,	" 12,	2d floor Officer's quarters.
" T. F. Jewell,	" 14,	1st floor do.
Lieutenant S. Hubbard,	" 9,	2d floor Old quarters, cadets.
" J. H. Dayton,	" 8,	2d floor do.
" C. S. Sperry,	" 9,	3d floor do.
" H. Knox,	" 13,	1st floor Officer's quarters.
" E. D. F. Heald,	" 12,	4th floor do.
" E. P. Wood,	" 12,	3d floor do.
" J. M. Miller,	" 14,	3d floor do.
" J. F. Meigs,	" 9,	3d floor do.
" C. C. Cornwell,	" 27,	Officer's quarters.
" R. R. Ingersoll,	" 15,	3d floor do.
" D. Kennedy,	" 15,	4th floor do.
" R. C. Derby,		City Hotel, Annapolis, Md.
" T. B. M. Mason,	" 12,	1st floor Officer's quarters.
" A. V. Wadhams,	" 14,	4th floor do.
" C. P. Perkins,	" 9,	1st floor Old quarters cadets.
" C. G. Bowman,		Maryland Hotel, Annapolis, Md.
" W. P. Potter,	" 30,	Hanover st., Annapolis, Md.
" J. B. Briggs,	" 98,	King George st., Annapolis, Md.
" A. P. Nazro,	" 27,	Hanover st., Annapolis, Md.
Master Aaron Ward,		Maryland av. & Hanover st., Annapolis, Md
Ensign W. H. H. Southerland,	No. 7,	2d floor Old quarters cadets.
" J. M. Roper,	" 7,	2d floor do.
" T. B. Howard,	" 7,	3d floor do.
" A. A. Michelson,	" 7,	3d floor do.
" A. M. Knight,	" 7,	1st floor do.
Medical Inspector A. L. Gihon,	" 5,	Officer's quarters.
P. A. Surgeon W. A. Corwin,	" 15,	1st floor Officer's quarters.
A.P.A. Surgeon J. J. Sowerby,	" 7,	2d floor Old quarters cadets.
A. Ast. Surgeon T. O. Walton,	" 11,	Maryland ave. Annapolis, Md.
Paymaster A. S. Kenny,	" 2,	Officer's quarters.
" S. T. Browne, (Storekeeper,)	No. 21,	Officer's quarters.

P.A. Engineer	C. H. Greenleaf,	" 7,	1st floor Old quarters cadets.	
"	J.L.D. Borthwick,	" 13,	3d floor do.	
"	W. L. Nicoll,	" 8,	2d floor do.	
"	G. E. Tower,	" 13,	2d floor Officer's quarters.	
"	D. Jones,	" 13,	4th floor do.	
"	C. W. Rae,	" 19,	do.	
Chaplain	R. Hudson,	" 16,	do.	
Professor	W. W. Hendrickson,	" 10,	do.	
"	J. M. Rice,	" 19,	do.	
"	R. S. Smith,	" 8,	do.	
"	J. R. Soley,	" 23,	do.	
"	L. F. Prud'homme,	" 26,	do.	
"	N. M. Terry,	" 9,	2d floor Old quarters cadets.	
"	C. E. Munroe,	" 7,	3d floor do.	
Ass't Prof.	T. Karney,		Maryland av., Annapolis, Md.	
"	W. W. Fay,	" 102,	Prince George st., Annapolis, Md.	
"	A. V. S. Courcelle,	" 101,	Church st., Annapolis, Md.	
"	E. Dovilliers,	" 19,	Corn Hill st., Annapolis, Md.	
"	J. Leroux,		Maryland Hotel Annapolis, Md.	
"	H. Dalmon,	" 8,	3d floor Old quarters cadets.	
"	P. Montaldo,	" 7,	3d floor do.	
"	Marshal Oliver,		Doc. & Cath. sts., Annapolis, Md.	
"	C. F. Blauvelt,	" 9,	1st floor Old quarters cadets.	
"	E. Lord,	" 8,	3d floor do.	
Secretary	R. M. Chase,	" 28,	Officer's quarters.	
Commissary	R. Swann,	" 22,	do.	
Ass't Librarian	J. J. Graff,	" 8,	West st., Annapolis, Md.	
1*st Clerk to Sup't*	J. G. Glynn,	" 43,	Church st., Annapolis, Md.	
2*d* "	Sam'l Jickling,	" 23,	Green st., Annapolis, Md.	
Cl'k to Comd't Cadets	C. M. McLeod,		Cathedral st., Annapolis, Md.	
" "	E. Worthington,		Maryland Hotel, Annapolis, Md.	
Boatswain	A. Milne,		U. S. S. "Dale," N. A.	
Gunner	Robert Sommers,		U. S. S. "Dale," N. A.	
Sword Master	A. J. Corbesier,		No. 27, Maryland ave., Annapolis, Md.	
Ass't Sword Master	J. B. Retz,		" King George st., Annapolis, Md.	
" "	G. Heintz,	"	35, Hanover st., Annapolis, Md.	
Boxing Master	Matthew Strohm,	"	96, King George st., Annapolis, Md.	

Marine Garrison.

Captain	McLane Tilton, Comd'g,	No. 90,	Prince George st., Annapolis, Md.
1*st Lieut.*	Wm. S. Muse,	No. 27,	Corn Hill st., Annapolis, Md.
"	J. M. T. Young,		Maryland Hotel, Annapolis, Md.
"	Sam'l K. Allen,	No. 7,	State House circle.
"	Sam'l H. Gibson,		Prince George & Tabernacle st., Annapolis, Md.

Naval Hospital near Annapolis.

Medical Inspector A. C. Gorgas, in charge.

ACADEMIC CALENDAR, 1876-77.

First Term.

Su.	Mo.	Tu.	We.	Th.	Fr.	Sa.
October.						
			Sept			
			20	21	22	23
24	25	26	27	28	29	30
Oct.						
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
November.						
Oct.			Nov			
29	30	31	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
December.						
Nov					Dec.	
26	27	28	29	30	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
January.						
Dec.						
24	25	26	27	28	29	30
	Jan.					
31	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20

Semi-Annual Examination.

Second Term.

Su.	Mo.	Tu.	We.	Th.	Fr.	Sa.
February.						
Jan.				Feb.		
28	29	30	31	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
				Mch		
25	26	27	28	1	2	3
March.						
Mch						
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31
April.						
Apr.						
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
May.						
Apr.		May				
29	30	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
					Jun.	
27	28	29	30	31	1	2
June 3	4	5	6	7	8	9

CONTENTS.

THE

UNITED STATES NAVAL ACADEMY.

The United States Naval Academy was founded in 1845, by Hon. George Bancroft, Secretary of the Navy, in the administration of President James K. Polk. It was formally opened October 10, of that year, under the name of the Naval School, with Commander Franklin Buchanan as Superintendent. It was placed at Annapolis, Md., on the land occupied by Fort Severn, which was given up by the War Department for the purpose. The course was fixed at five years, of which the first and last only were spent at the School, the intervening three being passed at sea. This arrangement was not strictly adhered to, the exigencies of the service making it necessary, in many cases, to shorten the period of study. In January, 1846, four months after the opening of the School, the students consisted of 36 Midshipmen, of the date of 1840, who were preparing for the examination for promotion; 13 of the date of 1841, who were to remain until drafted for service at sea; and 7 Acting Midshipmen, appointed since September of the previous year. The Midshipmen of the date of 1840 were the first to graduate, finishing their limited course in July, 1846, and they were followed in order by the subsequent dates, until the re-organization of the School, in 1851.

In September, 1849, a Board was appointed to revise the plan and regulations of the Naval School. The Board was composed of the following officers:

Commodore William B. Shubrick,
Commander Franklin Buchanan,
Commander Samuel F. DuPont,
Commander George P. Upshur,
Surgeon W. S. W. Ruschenberger,
Professor William Chauvenet,
Captain Henry Brewerton, U. S. A.

The plan reported by the Board was approved, and went into operation July 1, 1850.

The new organization provided for a course of seven years, the first two and last two at the School and the three intermediate years at sea. The School was placed under the supervision of the Bureau of Ordnance and Hydrography, and its name was changed to the United States Naval Academy. The corps of professors was enlarged, the course was extended, and the system of separate departments, with executive heads, was fully adopted. It was provided that a Board of Visitors should make an annual inspection of the Academy, and report upon its condition to the Secretary of the Navy. A suitable vessel was attached to the Academy as a practice-ship, and the annual practice-cruises were begun.

After the system had been in operation a year new changes were proposed, and the recommendations of the Academic Board on the subject were referred to the Board of Examiners of the year 1851, composed of the following officers:

Commodore David Conner,
Captain Samuel L. Breese,
Commander C. K. Stribling,
Commander A. Bigelow,
Commander Franklin Buchanan,
Lieutenant Thomas T. Craven.

The change recommended by the Board of Examiners, and adopted by the Department, consisted mainly in leaving out the requirement of three years of sea-service in

the middle of the course, thus making the four years of study consecutive. The practice-cruises supplied the place of the omitted sea-service, and gave better opportunities of training. The change went into operation in November, 1851, together with other improvements recommended by the Board. The system has continued, with slight modifications, to the present time. The first class to receive the benefit of it was that which entered in 1851. Six members of this class completed the course in three years, and graduated in June, 1854; the rest of the class followed in 1855.

In May, 1861, on the outbreak of the war, the Academy was removed to Newport, R. I. The three upper classes were detached and ordered to sea, and the remaining Acting Midshipmen were quartered in the Atlantic House and on board the Frigate Constitution. In September, 1865, the Academy was moved back to Annapolis, where it has since remained.

When the Bureau of Navigation was established, July 5, 1862, the Academy was placed under its supervision: March 1, 1867, it was placed under the direct care and supervision of the Navy Department; the administrative routine and financial management being still conducted through the Bureau. On the 11th of March, 1869, all official connection with the Bureau came to an end.

The term of the academic course was changed by law, March 3, 1873, from four to six years. The change took effect with the class which entered in the following summer.

In 1866, a class of Acting Third Assistant Engineers was ordered to the Academy for instruction. The course embraced the subjects of steam-engineering, iron-manufacture, chemistry, and mechanics, and practical exercises with the steam-engine and in the machine-shop. This class graduated in June, 1868, together with two Cadet-Engineers who had entered the Academy in 1867. After an interval of four years, in October, 1871, a new class of Cadet-Engineers was admitted. This class followed a two years' course, somewhat more extended than that of the class of 1868, and graduated in 1873. In 1872 and 1873, new classes were admitted, the first of which left the Academy in 1874 and the second in 1875. By an act of Congress approved February 24, 1874, the course of instruction for Cadet-Engineers was made four years, instead of two; and the new provision was first applied to the class entering the Academy in the year 1874.

There are now three classes of Cadet-Engineers at the Academy: the second, which entered in 1874 under the new law; and the third and fourth, admitted in 1875 and 1876, respectively.

BOARD OF VISITORS, JUNE, 1876.

Commodore DANIEL AMMEN, U. S. N., *President.*
General ROBERT B. POTTER, *Vice-President.*
D. C. GILMAN, L.L. D., President Johns Hopkins University.
General A. J. EDGERTON, of Minnesota.
General EDWARD C. ANDERSON, of Georgia.
Captain WILLIAM N. JEFFERS, U. S. N.
Colonel T. BAILEY MYERS, of New York.
Captain S. L. PHELPS, of the District of Columbia.
Captain OLIVER ELDREDGE, of California.
Rev. EDWARD D. NEILL, of Minnesota.

ACADEMIC CALENDAR.

1876-77.

1876.

Sept. 20.—Beginning of first term ..... Wednesday.

1877.

Jan. 22-27.—Semi-annual examination ..... Monday-Saturday.
Jan. 27.—End of first term ..... Saturday.
Jan. 29.—Beginning of second term ..... Monday.
June 10-20.—Annual examination ..... Sunday-Wednesday.
June 20.—End of academic year 1876-77 ..... Wednesday.
June 21.—Examination of candidates for admission as Cadet-Midshipmen ..... Thursday.
Sept. 5.—Examination of candidates for admission as Cadet-Engineers ..... Wednesday.
Sept. 12.—Examination of candidates for admission as Cadet-Midshipmen ..... Wednesday.
Sept. 20.—Beginning of first term 1877-78 ..... Thursday.

The academic months end on the following days:

1876-77.

October	Oct. 28	February	Mar. 3
November	Nov. 25	March	Mar. 31
December	Dec. 23	April	April 28
January	Jan. 20	May	June 2

1877-78.

October	Oct. 27	February	Mar. 9
November	Nov. 24	March	April 6
December	Dec. 22	April	May 4
January	Jan. 26	May	June 1

SEPTEMBER.

S.	M.	T.	W.	T.	F.	S.
....	....	....	....	....	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

OCTOBER.

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	....	....	....	....

NOVEMBER.

....	....	....	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	....	....

DECEMBER.

....	....	....	....	....	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31	....	....	....	....	....	....

JANUARY.

....	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31	....	....	....

FEBRUARY.

....	....	....	....	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	....	....	....

MARCH.

S.	M.	T.	W.	T.	F.	S.
....	....	....	....	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

APRIL.

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	....	....	....	....	....

MAY.

....	....	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	....	....

JUNE.

....	....	....	....	....	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
....	....	....	....	....	....	....

JULY.

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	....	....	....	....

AUGUST.

....	....	....	1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	....

OFFICERS

OF THE

UNITED STATES NAVAL ACADEMY.

REAR-ADMIRAL

CHRISTOPHER RAYMOND PERRY RODGERS,

SUPERINTENDENT.

COMMANDER NORMAN VON HELDREICH FARQUHAR,

Senior Aid to the Superintendent.

ACADEMIC STAFF.

COMMANDER EDWARD TERRY,

Commandant of Cadets.

SEAMANSHIP, NAVAL TACTICS, AND NAVAL CONSTRUCTION.

COMMANDER HENRY LYCURGUS HOWISON,

Head of Department.

LIEUTENANT-COMMANDER SILAS WRIGHT TERRY.
LIEUTENANT-COMMANDER COLBY MITCHELL CHESTER,
LIEUTENANT-COMMANDER CHARLES VERNON GRIDLEY,
LIEUTENANT EUGENE DE FOREST HEALD,

Instructors in Seamanship, Naval Tactics, and Naval Construction.

MATTHEW STROHM,

Instructor in Boxing, Swimming, and Gymnastics.

ORDNANCE AND GUNNERY.

COMMANDER JAMES O KANE,

Head of Department.

LIEUTENANT-COMMANDER MERRILL MILLER,

In charge of practice-ships.

LIEUTENANT-COMMANDER BOWMAN HENDRY MCCALLA
LIEUTENANT DUNCAN KENNEDY,
LIEUTENANT THEODORUS BAILEY MYERS MASON,
LIEUTENANT ALBION VARETTE WADHAMS,

Instructors in Naval Gunnery and Infantry Tactics.

ANTOINE J. CORBESIER,

Sword-Master.

JEAN B. RETZ,
GEORGE HEINTZ,

Assistant Sword-Masters.

MATHEMATICS.

PROFESSOR WILLIAM WOODBURY HENDRICKSON,

Head of Department.

LIEUTENANT-COMMANDER CHARLES WILLIAM KENNEDY,
LIEUTENANT-COMMANDER SAMUEL HOUSTON BAKER,
LIEUTENANT SOCRATES HUBBARD, A. M.,
LIEUTENANT JAMES HENRY DAYTON,
LIEUTENANT CHARLES STILLMAN SPERRY,
LIEUTENANT ROYAL RODNEY INGERSOLL,
ENSIGN WILLIAM HENRY HUDSON SOUTHERLAND,
ENSIGN JESSE MIMS ROPER,
ENSIGN THOMAS BANTON HOWARD,

Instructors in Mathematics.

STEAM-ENGINEERING.

CHIEF ENGINEER CHARLES HENRY BAKER,

Head of Department.

PASSED ASSISTANT ENGINEER CHARLES HOWE GREENLEAF,
PASSED ASSISTANT ENGINEER JOHN LIVINGSTON DINWIDDIE BORTHWICK, A. M.,
PASSED ASSISTANT ENGINEER WILLIAM LEONARD NICOLL,
PASSED ASSISTANT ENGINEER GEORGE EDWARD TOWER,
PASSED ASSISTANT ENGINEER DAVID JONES,
PASSED ASSISTANT ENGINEER CHARLES WHITESIDE RAE, C. E.,

Instructors in Steam-Engineering.

ASTRONOMY, NAVIGATION, AND SURVEYING.

COMMANDER JOHN ADAMS HOWELL,

Head of Department.

LIEUTENANT-COMMANDER ALLAN DANVERS BROWN,
LIEUTENANT CHARLES PLUMMER PERKINS,
LIEUTENANT CHARLES GRIMES BOWMAN,

Instructors in Astronomy, Navigation, and Surveying.

PHYSICS AND CHEMISTRY.

COMMANDER WILLIAM THOMAS SAMPSON,

Head of Department.

LIEUTENANT-COMMANDER THEODORE FRELINGHUYSEN JEWELL,
ENSIGN ALBERT ABRAHAM MICHELSON,
PROFESSOR NATHANIEL MATSON TERRY, A. M., PH. D.,
PROFESSOR CHARLES EDWARD MUNROE, S. B.,

Instructors in Physics and Chemistry.

MECHANICS AND APPLIED MATHEMATICS.

PROFESSOR JOHN MINOT RICE, S. B.,

Head of Department.

LIEUTENANT HARRY KNOX,
LIEUTENANT CHARLES CARPENTER CORNWELL,

Instructors in Mechanics and Applied Mathematics.

ENGLISH STUDIES, HISTORY, AND LAW.

PROFESSOR JAMES RUSSELL SOLEY, A. B.,

Head of Department.

LIEUTENANT EDWARD PARKER WOOD,
LIEUTENANT JAMES MADISON MILLER,
LIEUTENANT JOHN FORSYTH MEIGS,
LIEUTENANT WILLIAM PARKER POTTER,
LIEUTENANT JOHN BRADFORD BRIGGS,
ENSIGN AUSTIN MELVIN KNIGHT,
ASSISTANT PROFESSOR WILLIAM WIRT FAY, A. M.,
ASSISTANT PROFESSOR ELIOT LORD, A. B.,

Instructors in English Studies, History, and Law.

MODERN LANGUAGES.

PROFESSOR LUCIEN FRANKLIN PRUD'HOMME, A. M.,
Head of Department.

LIEUTENANT RICHARD CATTON DERBY,
LIEUTENANT ARTHUR PHILLIPS NAZRO,
MASTER AARON WARD,
ASSISTANT PROFESSOR ALPHONSE V. S. COURCELLE,
ASSISTANT PROFESSOR EUGENE DOVILLIERS,
ASSISTANT PROFESSOR JULES LEROUX,
ASSISTANT PROFESSOR HIPPOLYTE DALMON,
Instructors in French and Spanish.

ASSISTANT PROFESSOR PEDRO MONTALDO,
Instructor in Spanish.

DRAWING.

PROFESSOR RICHARD SOMERS SMITH, A. M.,
Head of Department.

ASSISTANT PROFESSOR MARSHAL OLIVER,
ASSISTANT PROFESSOR CHARLES FRANCIS BLAUVELT, N. A.,
Instructors in Drawing.

OFFICERS NOT ATTACHED TO THE ACADEMIC STAFF.

MEDICAL INSPECTOR ALBERT LEARY GIHON, A. M., M. D.
PASSED ASSISTANT SURGEON WILLIAM ALBERT CORWIN, M. D.
ACTING PASSED ASSISTANT SURGEON JOSEPH JOHN SOWERBY, M. D.
ACTING ASSISTANT SURGEON THOMAS OLIVER WALTON, M. D.
PAYMASTER ALBERT SEWALL KENNY, A. B.
PAYMASTER SAMUEL TRACY BROWNE, *Storekeeper.*
CHAPLAIN ROBERT HUDSON, M. A.
ASSISTANT PROFESSOR THOMAS KARNEY, A. M., *Librarian.*
JAMES JOHNSON GRAFF, *Assistant Librarian.*
RICHARD SWANN, *Commissary.*
RICHARD MOALE CHASE, *Secretary.*

JAMES G. GLYNN, *First Clerk.*
SAMUEL JICKLING, *Second Clerk.*
CHARLES MARION MCLEOD, *Clerk to Commandant of Cadets.*
EUGENE WORTHINGTON, *Third Clerk to Superintendent.*

MARINE GARRISON.

CAPTAIN MCLANE TILTON, *Commanding.*
FIRST LIEUTENANT WILLIAM SULLIVAN MUSE.
FIRST LIEUTENANT JAMES MARMADUKE TERRET YOUNG.
FIRST LIEUTENANT SAMUEL KUYPERS ALLEN.
SECOND LIEUTENANT SAMUEL HOPPER GIBSON.

MATES.

C. J. MURPHY, SAMUEL GEE, WILLIAM G. SMITH, L. M. MELCHER, JOHN H. BROWN — *Attached to the United States Gunnery-ship Santee and to the Sloop-of-war Dale.*

ROBERT SILVER — *Attached to United States Steamer Nantucket (iron-clad).*

BENJAMIN G. PERRY, JOSEPH RODGERS — *Attached to the United States Steamer Phlox (steam-tender).*

ACADEMIC BOARD.

REAR-ADMIRAL C. R. P. RODGERS, U. S. N.
COMMANDER EDWARD TERRY, U. S. N.
COMMANDER J. A. HOWELL, U. S. N.
COMMANDER H. L. HOWISON, U. S. N.
COMMANDER JAMES O'KANE, U. S. N.
COMMANDER W. T. SAMPSON, U. S. N.
CHIEF ENGINEER C. H. BAKER, U. S. N.
PROFESSOR W. W. HENDRICKSON, U. S. N.
PROFESSOR J. M. RICE, S. B., U. S. N.
PROFESSOR J. R. SOLEY, A. B., U. S. N.
PROFESSOR R. S. SMITH, A. M.
PROFESSOR L. F. PRUD'HOMME, A. M.

CADET-OFFICERS.

CADET-LIEUTENANT-COMMANDER.

W. F. FULLAM.

CADET-LIEUTENANTS.

H. M. WITZEL.
J. M. ORCHARD.
O. G. DODGE.
W. D. DAVID.

CADET-MASTERS.

HIERO TAYLOR.
A. G. WINTERHALTER.
W. V. BRONAUGH.
ALFRED JEFFRIES.

ADJUTANT.

F. W. TOPPAN.

CADET-ENSIGNS.

F. M. BOSTWICK.
T. M. BRUMBY.
A. W. GRANT.
P. V. LANSDALE.

CADET-PETTY-OFFICERS.

First Captains of Gun's Crews.

R. C. Paris.
E. E. Wright.
J. P. Parker.
W. M. Constant.
H. H. Rodgers.
J. H. Oliver.
V. S. Nelson.
B. W. Hodges.
H. O. Dunn.
F. R. Heath.
G. W. Denfeld.
A. W. Dodd.
F. B. Case.
N. J. L. T. Halpine.
W. R. Rush.
W. S. Benson.

Second Captains of Gun's Crews.

H. M. Dombaugh.
Simon Cook.
G. F. Ormsby.
A. C. Almy.
J. H. Fillmore.
J. H. Glennon.
J. G. Quinby.
T. S. Rodgers.
H. S. Knapp.
C. S. McClain.
R. C. Smith.
H. McL. P. Huse.
C. N. Atwater.
J. H. L. Holcombe.
Edward Lloyd.
P. B. Bibb.

Graduating class of 1876—42 *members.*

Order of general merit.	Name.	State.	Date of admission.	Age at date of admission.		Order of merit in—									Number of demerits.	Sea-service in practice-ships.	
				Years.	Months.	Seamanship.	Practical exercises.	Naval architecture.	Ordnance and armor.	Steam-engineering.	Navigation.	Light and heat.	Public law.	Spanish.		Months.	Days.
*1	**Brown, Stimpson Joseph**	New York	Sept. 16, 1872	17	11	11	14	2	1	1	2	1	3	1	119	6	11
*2	**Gearing, Henry Chalfant**	Pennsylvania	June 12, 1872	17	3	6	13	7	2	5	1	2	2	13	145	8	28
3	Foulk, George Clayton	Pennsylvania	June 14, 1872	15	7	7	1	4	3	3	4	7	13	6	46	8	28
4	Walling, Burns Tracy	Ohio	June 5, 1872	17	4	3	11	3	12	2	7	4	10	8	141	6	11
5	Potts, Templin Morris	At large	June 6, 1872	16	7	2	5	10	6	6	10	5	14	4	159	6	11
6	Allen, William Herschell	Illinois	Sept. 26, 1872	15	10	9	11	6	7	16	6	3	5	5	85	6	11
7	Sears, James Hamilton	New York	Sept. 20, 1871	16	8	9	8	8	14	4	9	14	16	27	133	8	25
8	Jenkins, Stephen	New York	Sept. 20, 1871	14	2	14	7	14	10	7	11	22	1	15	112	8	25
9	Winch, Thomas Garfield	Ohio	Sept. 20, 1872	17	10	5	5	1	4	11	8	15	11	16	90	6	11
10	Roush, Clifford Joseph	Virginia	June 5, 1872	17	9	8	1	9	8	8	19	20	24	40	78	6	11
11	Katz, Edward Marc	Wisconsin	June 8, 1872	16	7	21	26	21	11	12	24	9	11	3	158	6	11
12	Rogers, Charles Custis	Tennessee	June 7, 1872	16	0	32	22	12	17	36	15	11	5	7	85	6	11
13	McLean, Walter	At large	June 6, 1872	16	10	28	35	24	9	19	27	18	9	19	143	6	11
14	Mayo, Henry Thomas	Vermont	June 13, 1872	15	6	12	25	23	13	12	18	18	17	22	134	6	11
15	Culver, Abraham Ellis	New York	June 5, 1872	16	2	35	37	17	20	41	3	6	8	10	99	8	28
16	Reynolds, Lovell Knowles	Alabama	June 5, 1871	14	4	4	4	5	19	10	29	25	19	25	150	8	25
17	Varnum, William Lahy	Pennsylvania	June 5, 1871	16	6	1	3	18	15	15	21	32	21	40	120	11	20
18	Henderson, Richard	North Carolina	Sept. 28, 1872	17	1	24	18	16	17	17	5	17	33	19	74	6	11
19	Pond, Charles Fremont	Connecticut	June 12, 1872	15	7	36	34	29	21	22	13	16	20	11	165	8	28
20	Rollins, Anthony Wayne	Kentucky	June 10, 1872	17	3	13	39	20	27	35	15	11	22	27	109	8	28
21	Ray, Robert Clary	At large	Oct. 1, 1872	17	11	29	18	33	16	17	34	30	23	32	101	6	11

22	Newton, John Thomas	At large	Oct. 14, 1872	17	0	24	14	34	28	32	36	25	28	2	157	6	11
23	Rose, Waldemar d'Arcy	At large	June 5, 1872	15	11	32	35	12	5	19	13	7	15	22	107	6	11
24	Gillmore, James Clarkson	Pennsylvania	Sept. 20, 1871	17	2	26	26	27	29	26	31	23	39	30	62	8	25
25	Jardine, Augustus Edward	At large	Sept. 21, 1870	15	8	19	17	26	25	40	29	32	22	22	74	12	27
26	Case, Daniel Rogers	At large	June 5, 1872	15	0	17	29	24	21	12	20	32	31	18	147	8	28
27	Mallory, Stevenson Blount	Virginia	June 12, 1872	16	0	23	32	15	24	31	12	10	17	21	116	8	28
28	Chambers, Washington Irving	New York	June 5, 1871	15	2	20	10	11	23	26	33	39	41	38	153	11	20
29	Sherman, Francis Howland	Missouri	Sept. 20, 1871	16	5	32	22	37	26	23	26	27	25	29	100	11	20
30	Gove, Charles Augustus	New Hampshire	June 5, 1871	16	11	15	18	19	40	36	31	41	35	31	138	8	25
31	Piepmeyer, Louis William	At large	Sept. 22, 1871	17	0	29	16	36	37	38	24	28	4	11	95	8	25
32	Coffman, De Witt	Virginia	June 6, 1872	17	6	22	22	21	32	9	38	36	25	35	97	6	11
33	Tappan, Benjamin	Arkansas	Sept. 21, 1871	15	5	17	31	38	33	33	22	35	5	39	130	8	25
34	Proudfit, John McLean	At large	Sept. 24, 1872	17	5	16	18	30	35	28	17	42	40	32	125	6	11
35	Minett, Henry	Kentucky	June 8, 1872	15	9	36	42	28	30	25	22	37	42	9	151	6	11
36	Hannum, William Gangwere	Pennsylvania	Sept. 23, 1872	16	1	38	32	40	31	30	28	21	25	25	114	8	28
37	Mulligan, Richard Thomas	New Jersey	June 5, 1871	15	0	31	28	31	36	28	39	31	34	34	99	11	20
38	Hogg, William Stetson	At large	Sept. 21, 1872	15	10	42	37	41	41	23	36	23	36	16	126	6	11
39	Fisher, Elstner Nelson	Pennsylvania	Sept. 21, 1872	17	11	39	40	31	31	21	35	13	37	35	163	6	11
40	Wise, Edward Everett	At large	June 5, 1871	16	6	41	41	34	38	34	40	38	30	42	151	8	25
41	Griffin, Thomas Dillard	Virginia	Sept. 20, 1872	17	9	40	29	42	42	42	41	28	37	14	23	8	28
42	Braunersreuther, William	Illinois	Sept. 23, 1871	17	7	27	9	38	39	39	42	40	32	35	137	6	11

†Graduated September, 1876.

CADET-MIDSHIPMEN.

First class—46 members.

Order of annual merit.	Name.	State.	Date of admission.	Age at date of admission.		Order of merit in—										Number of demerits.	Sea-service in practice-ships.	
				Years.	Months.	Seamanship.	Ship-building.	Naval tactics.	Infantry tactics.	Astronomy.	Applied mathematics.	Electricity.	English composition.	French.	Spanish.		Months.	Days.
39	Benson, William Shepherd	Georgia	Sept. 21, 1872	16	11	27	40	47	21	47	44	22	48	50	44	147	9	13
14	Bostwick, Frank Matteson	Wisconsin	Sept. 26, 1873	16	5	39	16	45	20	8	23	14	8	22	14	204	5	27
12	Brice, Jonathan Kearsley	Ohio	June 13, 1873	17	8	29	10	36	19	12	14	3	23	39	37	189	5	27
10	Bronaugh, William Venable	Kentucky	June 5, 1873	17	9	33	19	9	23	8	5	9	25	21	43	190	5	27
15	Brumby, Thomas Mason	Georgia	Sept. 26, 1873	17	10	31	26	12	35	17	29	8	12	25	37	173	5	27
44	Burdick, William Leslie	Ohio	Sept. 26, 1873	16	9	36	18	51	50	43	51	32	11	43	20	217	5	27
34	Case, Frank Blair	Michigan	June 7, 1873	15	7	18	32	52	28	21	41	25	50	45	30	144	5	27
20	Constant, Walter Maibee	Indiana	June 13, 1873	16	3	10	10	26	16	15	15	33	52	30	36	163	5	27
43	Cook, Simon	Missouri	June 6, 1873	16	11	51	53	38	40	51	47	50	31	50	37	95	5	27
7	David, William Glenn	New York	Sept. 25, 1873	17	2	20	3	6	8	4	7	10	6	6	11	150	5	27
31	Denfeld, George William	Massachusetts	Sept. 26, 1873	17	1	45	25	41	32	40	18	25	46	45	18	137	5	27
33	Dodd, Arthur Wright	Indiana	June 6, 1873	16	10	44	33	34	29	30	41	45	23	16	33	74	5	27
6	Dodge, Omenzo George	Kansas	June 13, 1873	17	0	1	6	4	5	2	9	7	38	39	28	96	5	27
42	Dombaugh, Harry Mason	Ohio	June 6, 1872	16	4	39	43	21	45	46	44	42	51	47	50	181	9	13
26	Dunn, Herbert Omar	Rhode Island	June 6, 1873	16	0	30	15	35	23	26	27	25	38	37	40	162	5	27
13	Fechteler, Augustus Francis	At large	June 5, 1873	15	0	21	36	11	32	13	10	35	3	6	13	185	5	27
*1	**Fullam, William Freeland**	New York	Sept. 24, 1873	17	11	2	2	1	2	1	4	4	3	13	14	124	5	27
24	Gleaves, Albert	Tennessee	June 10, 1873	15	5	11	7	39	29	18	29	24	42	44	40	202	5	27
27	Grant, Albert Weston	Wisconsin	June 9, 1873	17	1	24	14	17	26	20	20	45	46	39	31	149	5	27
40	Hall, Alfred Lovell	Ohio	Sept. 16, 1872	17	11	31	43	49	40	36	33	38	54	28	40	183	9	13
36	Halpine, Nicholas John Lane Trowbridge.	New York	June 9, 1871	14	8	20	46	19	29	37	47	50	35	3	20	208	9	13

32	Harrison, Horace Wellford	At large	Sept. 24, 1872	16	9	47	41	12	36	41	38	37	3	23	31	243	9	13
30	Heath, Frank Rives	At large	Sept. 23, 1873	16	4	15	29	31	12	42	35	33	33	24	22	131	5	27
25	Hodges, Ben Ward	Mississippi	Sept. 23, 1873	17	5	47	46	33	16	29	29	28	19	19	8	123	5	27
9	Jeffries, Alfred	Texas	June 9, 1873	17	9	3	7	3	14	21	13	11	21	4	3	59	5	27
35	Johnson, Henry Albert	At large	June 5, 1872	17	0	38	21	43	39	22	43	20	38	38	48	211	9	13
11	Jordan, John Newell	Maine	June 5, 1873	17	8	3	12	6	6	25	12	11	32	13	6	195	5	27
45	Katz, Koroku	Empire of Japan	June 7, 1871	16	4	47	38	46	26	54	52	53	37	.....	.....	162	5	27
46	Kunitomo, Giro	Empire of Japan	Oct. 7, 1872	17	1	46	43	39	42	53	47	54	33	.....	.....	117	5	27
28	Lansdale, Philip Van Horn	At large	June 6, 1873	15	3	28	23	29	48	33	23	15	49	49	46	104	5	27
23	Nelson, Valentine Sevier	Tennessee	June 6, 1873	17	5	41	31	41	9	18	23	17	28	29	16	160	5	27
22	Oliver, James Harrison	Georgia	June 12, 1873	16	0	20	38	14	51	32	18	30	16	20	4	161	5	27
5	Orchard, John Madison	Missouri	June 11, 1873	15	9	5	5	2	1	11	7	2	27	8	22	174	5	27
3	Paris, Russel Clark	New York	Sept. 23, 1873	14	1	36	13	16	7	7	1	6	9	2	2	173	5	27
17	Parker, James Philip	North Carolina	June 6, 1873	17	8	26	22	23	14	16	28	42	1	11	8	113	5	27
21	Rogers, Henry Horace	Illinois	June 13, 1873	17	9	20	31	18	32	14	38	19	21	26	31	75	5	27
38	Rush, William Rees	Louisiana	June 6, 1872	14	8	43	21	19	46	41	34	40	45	27	44	203	9	13
*2	**Taylor, Hiero**	Illinois	Sept. 29, 1873	17	0	9	1	9	12	5	2	1	15	15	6	100	5	27
29	Toppan, Francis Winship	Massachusetts	Sept. 22, 1873	17	9	18	27	24	38	31	35	23	35	32	34	149	5	27
19	Wakenshaw, Harry Charles	New Jersey	June 10, 1873	16	6	13	29	5	9	34	21	30	28	17	25	131	5	27
41	Werlich, Percival Julius	Wisconsin	June 16, 1873	16	4	31	50	52	44	38	47	38	44	39	22	268	5	27
37	Wilson, John Cochran, jr	New York	Sept. 25, 1873	16	3	34	22	27	42	45	29	44	43	35	25	218	5	27
8	Winterhalter, Albert Gustavus	Michigan	Sept. 22, 1873	16	11	14	9	24	4	10	6	16	9	1	1	122	5	27
4	Witzel, Horace Mark	Wisconsin	June 5, 1873	15	4	6	4	8	3	3	3	5	26	8	10	163	5	27
18	Woodworth, Selim Edward	At large	Sept. 30, 1872	15	5	12	19	29	21	48	32	20	2	5	4	149	9	13
16	Wright, Edward Everett	Massachusetts	Sept. 20, 1873	17	0	6	34	22	36	26	16	35	19	10	12	131	5	27

CADET-MIDSHIPMEN.

Second class—43 members.

Order of annual merit.	Name.	State.	Date of admission.	Age at date of admission.		Order of merit in—					Number of demerits.	Sea-service in practice-ships.	
				Years.	Months.	Mathematics.	Chemistry and physics.	History and rhetoric.	French.	Drawing.		Months.	Days.
§	Almy, Augustus Craven	At large	June 6, 1872	15	6	.....	.....	.....	.....	.....	177	6	24
10	Atwater, Charles Nelson	New York	Sept. 24, 1873	16	3	10	10	3	8	16	125	5	8
17	Bibb, Peyton Benajah	Alabama	June 12, 1874	17	3	15	24	14	10	37	99	3	0
27	Biddle, Spencer Fullerton Baird	At large	June 13, 1874	15	5	24	27	35	31	3	242	3	0
30	Canfield, William Chase	At large	Sept. 23, 1873	16	1	31	31	25	13	10	128	5	8
37	Carrington, Austin Downs	Virginia	Sept. 23, 1873	17	5	38	35	37	28	40	241	5	8
35	Clark, George Ramsey	Ohio	June 9, 1874	17	3	40	38	22	17	39	241	3	0
25	Craven, John Eccleston	New Jersey	Sept. 24, 1874	15	10	21	22	39	40	16	187	3	0
33	Dent, Baine Caruthers	At large	June 5, 1873	16	7	33	27	32	30	38	222	5	8
36	Fauntleroy, Robert Powell	At large	Sept. 23, 1873	16	5	38	37	30	38	12	245	5	8
*1	**Fillmore, John Hudson**	Illinois	Sept. 24, 1874	17	10	1	1	1	7	1	130	3	0
32	Garrett, Charles Warren	Indiana	June 5, 1874	17	10	33	35	14	32	41	202	3	0
*2	**Glennon, James Henry**	California	Sept. 24, 1874	17	7	3	1	12	3	8	70	3	0
41	Hall, William Edward Wyatt	Maryland	June 14, 1873	17	3	36	38	37	42	20	217	5	8
34	Hetherington, James Henry	Iowa	June 9, 1874	17	7	35	32	34	33	22	166	3	0
11	Holcombe, John Hite Lee	At large	June 27, 1874	17	9	16	7	10	9	34	106	3	0
31	Hooke, Horatio Hill	Illinois	Sept. 26, 1874	17	0	30	23	31	35	26	232	3	0
14	Hughes, Richard Morris	Pennsylvania	Sept. 25, 1874	15	8	13	14	5	14	43	250	3	0
9	Huse, Harry McLaren Pinkney	New York	Sept. 30, 1874	15	10	11	5	8	1	6	209	3	0
13	Kimmell, Harry	Pennsylvania	Sept. 28, 1874	14	5	11	4	27	15	30	155	3	0
5	Knapp, Harry Shepard	Connecticut	June 26, 1874	18	0	7	8	2	6	9	233	3	0

23	Knapp, John Joseph	Missouri	June 9, 1874	16	8	23	18	18	38	42	162	3	0
12	Lloyd, Edward, jr	Maryland	June 17, 1874	16	11	13	19	7	4	20	74	3	0
6	McClain, Charles Sumner	Indiana	Nov. 2, 1874	17	2	5	11	10	21	12	173	3	0
24	McDonnell, John Edmund	Nevada	Sept. 30, 1874	16	4	29	17	35	27	35	95	3	0
§	Ormsby, George Francis	Ohio	Sept. 24, 1873	17	4	......	......	......	......	......	83	3	8
29	Poundstone, Homer Clarke	West Virginia	Sept. 24, 1874	14	0	24	33	26	24	32	173	3	0
40	Purcell, John Lewis	New Jersey	Sept. 29, 1873	17	4	36	40	33	41	25	221	5	8
*3	**Quinby, John Gardner**	At large	June 12, 1874	14	10	2	6	8	12	27	223	3	0
*4	**Rodgers, Thomas Slidell**	District of Columbia	Sept. 24, 1874	16	1	4	8	4	2	33	137	3	0
18	Rodgers, William Ledyard	California	June 11, 1874	14	4	18	14	22	19	29	235	2	19
39	Rogers, Allen Grey	North Carolina	June 12, 1874	14	6	31	42	39	18	41	244	4	0
22	Ryan, Thomas William	Pennsylvania	June 13, 1873	16	11	24	20	29	16	10	195	5	8
21	Shipley, John Harry	Missouri	Sept. 30, 1874	16	6	21	26	21	21	23	149	3	0
16	Skinner, Frank Colby	Massachusetts	Sept. 26, 1874	17	6	20	13	13	19	5	144	3	0
7	Smith, Roy Campbell	Virginia	Oct. 3, 1874	16	2	6	11	19	5	6	56	3	0
26	Sparhawk, George	Massachusetts	Sept. 24, 1874	17	6	27	31	20	28	14	126	3	0
8	Sprague, Frank Julian	Massachusetts	Sept. 29, 1874	17	2	9	3	6	25	4	251	3	0
38	Stafford, George Henry	Iowa	June 10, 1874	17	11	41	29	17	23	31	89	3	0
28	Todd, Wilson Lemuel	Pennsylvania	June 5, 1873	15	1	28	21	28	36	36	198	1	0
20	White, William Porter	At large	June 30, 1874	15	5	17	16	42	36	16	218	3	0
19	Wright, Robert Kemp	Pennsylvania	June 12, 1873	14	8	19	25	22	11	14	249	5	8
15	Young, Feramorz Little	Utah	Sept. 24, 1874	16	0	8	30	14	26	2	72	3	0

§ Turned back from the first class.

CADET-MIDSHIPMEN.

Third class—59 members.

Order of annual merit.	Name.	State.	Date of admission.	Age at date of admission.		Order of merit in—				Number of demerits.	Sea-service in practice-ships.	
				Years.	Months.	Mathematics.	English.	French.	Drawing.		Months.	Days.
§	Bailey, Prentice	Kentucky	Sept. 28, 1874	17	1	.....	.....	.....	.....	254	3	0
46	Barkley, Richard Warren	Missouri	June 19, 1875	16	3	49	51	42	12	55	2	19
19	Barnard, Louis Hull	Colorado	June 13, 1874	16	11	24	12	25	44	79	2	19
6	Beale, Joseph	Pennsylvania	Oct. 12, 1874	14	10	6	11	28	36	267	2	19
11	Bell, John Arthur	West Virginia	June 13, 1874	16	11	9	21	9	43	168	2	19
44	Belmont, Oliver Hazard Perry	New York	Sept. 30, 1874	14	10	34	52	12	55	302	2	19
50	Bitler, Reuben Oscar	Pennsylvania	June 19, 1875	16	1	48	59	62	20	58	2	19
24	Blish, John Bell	Indiana	Sept. 15, 1875	15	0	10	39	53	51	148	2	19
38	Brown, Guy Warner	Indiana	June 19, 1875	17	2	32	39	58	29	99	2	19
55	Buchanan, Wilson Wildman	Ohio	June 19, 1875	17	3	59	50	74	8	129	2	19
§	Cahoon, James Blake	Vermont	June 10, 1874	17	6	.....	.....	.....	.....	115	3	0
14	Chase, Henry Sanders	Louisiana	June 21, 1875	16	10	19	13	25	11	108	2	19
4	Clements, Abner Brush	Missouri	June 21, 1875	17	6	1	14	40	25	144	2	19
40	Cramer, Ambrose	Maryland	Sept. 28, 1874	17	6	34	45	41	3	268	2	19
22	Cunningham, Andrew Charles	New York	June 9, 1874	16	4	19	25	44	4	41	2	19
23	Dougherty, John Allen	Missouri	June 12, 1874	16	9	19	20	44	26	64	2	19
33	Drayton, Percival Langdon	New York	June 10, 1874	16	2	42	38	5	16	328	2	19
52	French, George Ross	At large	June 21, 1875	17	11	51	42	61	63	101	2	19
53	Garrett, Leigh Osborn	New York	Sept. 13, 1875	15	1	49	61	44	45	192	2	19
21	Garrett, Le Roy Mason	New York	Sept. 16, 1875	18	0	17	30	20	9	144	2	19
35	Gibbons, John Henry	Michigan	Sept. 15, 1875	16	8	53	8	30	58	289	2	19
15	Gibson, John	Kentucky	Feb. 16, 1874	18	0	4	54	16	5	134	2	19

34	Gill, William Andrew	Pennsylvania	June 21, 1875	16	5	31	31	62	28	144	2		19
32	Gorgas, Miles Carpenter	Pennsylvania	Sept. 11, 1875	14	2	41	42	7	55	20	2		19
31	Graham, William Alfred	New York	Sept. 28, 1874	14	11	28	29	66	29	145	2		19
25	Harlow, Charles Henry	New York	Sept. 15, 1875	17	0	39	6	37	38	285	2		19
27	Harrison, George Edward	Michigan	June 19, 1875	17	11	26	18	41	36	311	2		19
5	Hayden, Edward Everett	Illinois	June 21, 1875	16	2	16	2	6	1	119	2		19
1	Hood, John	Alabama	Sept. 15, 1875	15	9	2	6	9	18	225	2		19
7	Jungen, Charles William	Wisconsin	Sept. 24, 1874	15	6	15	9	11	12	194	2		19
43	Kellogg, Francis Woodruff	Connecticut	June 21, 1875	17	10	43	34	54	45	226	2		19
56	King, William Nephew, jr	Georgia	June 21, 1875	17	5	64	58	19	53	321	2		19
36	Lopez, Robert Files	Tennessee	Sept. 29, 1874	17	6	30	32	23	66	236	2		19
57	Luby, John Frazer	New York	June 21, 1875	17	11	63	65	71	55	259	2		19
9	Marsh, Charles Carleton	Indiana	Sept. 14, 1875	17	1	23	2	31	40	141	2		19
54	Maxwell, William John	At large	June 9, 1874	15	2	61	39	41	60	161	2		19
20	Menefee, Daniel Preston	California	Sept. 25, 1874	16	6	30	10	20	39	102	2		19
3	Miner, Randolph Huntington	Ohio	June 19, 1875	15	7	7	1	2	21	66	2		19
13	Moore, John McConnell	Indiana	June 21, 1875	17	6	22	4	32	54	221	2		19
51	Mudd, John Alexis	Missouri	Sept. 11, 1875	15	3	45	51	68	26	270	2		19
40	Norris, Calvin Columbus Jackson	Idaho Territory	Sept. 15, 1875	17	8	44	48	11	33	69	2		19
49	Parsons, Frank Bailey	Massachusetts	Sept. 15, 1875	17	6	56	34	28	33	194	2		19
42	Read, Maurice Lance	South Carolina	Sept. 28, 1874	15	10	47	23	35	48	140	2		19
8	Ripley, Charles Stedman	At large	June 17, 1875	17	11	8	21	22	2	106	2		19
18	Robinson, Herbert Judson	New Hampshire	Sept. 15, 1875	16	6	25	14	16	7	99	2		19
17	Schwerin, Rennie Pierre	New York	Sept. 25, 1874	16	1	18	22	16	5	116	2		19
29	Scott, George Andrew	Indiana	June 21, 1875	17	0	32	17	66	41	201	2		19
48	Sears, Walter Jesse	Pennsylvania	June 21, 1875	17	8	53	26	69	41	118	2		19
12	Sloan, Robert Sage	New York	June 21, 1875	15	7	12	18	24	24	182	2		19
39	Snowden, Thomas	New York	June 21, 1875	17	10	39	48	41	21	61	2		19
28	Stardevant, Harry Leland	Maine	June 13, 1874	17	8	13	56	35	29	296	2		19
30	Swift, Franklin	Massachusetts	June 9, 1874	16	1	27	33	37	52	170	2		19
46	Thom, William Arthur	At large	June 21, 1875	17	8	58	45	15	21	64	2		19
26	Tillman, Edwin Hoyd	Tennessee	Sept. 14, 1875	16	10	14	42	62	33	157	2		19
37	Webster, Edwin Belden	Connecticut	Sept. 28, 1874	16	6	37	34	33	12	281	2		19

§ Turned back from the second class.

CADET-MIDSHIPMEN.

Third class—59 *members*—Continued.

Order of annual merit.	Name.	State.	Date of admission.	Age at date of admission.		Order of merit in—				Number of demerits.	Sea-service in practice-ships.	
				Years.	Months.	Mathematics.	English.	French.	Drawing.		Months.	Days.
45	Welsh, George Silvis	Pennsylvania	Sept. 24, 1874	17	7	28	59	41	45	288	2	19
16	Wike, Harvey	Illinois	Sept. 16, 1875	14	3	5	28	42	50	273	2	19
10	Wilkinson, Ernest	Louisiana	June 19, 1875	17	2	11	16	8	18	206	2	19
2	Woodworth, Frederick Augustus	California	June 19, 1875	16	8	3	5	1	16	279	2	19

CADET-MIDSHIPMEN.

Fourth class—124 *members.*

Name.	State.	Date of admission.	Age at date of admission.	
			Yrs.	Mos.
Ackerman, Albert Ammerman	New Jersey	June 21, 1876	16	11
Alger, Philip Rounseville		Sept. 11, 1876	17	0
Andrews, Horace Burlingame	Michigan	June 22, 1876	15	1
Ashmore, Henry Beckwith		Oct. 3, 1876	15	4
Babcock, William Frederic		Sept. 19, 1876	15	2
Bailey, John Bellamy	Florida	Sept. 15, 1875	16	7
Bellinger, Oscar Henry	Oregon	June 21, 1876	16	6
Berkeley, Francis Louis	Virginia	Sept. 14, 1875	16	4
Bernadou, John Baptiste	Delaware	Sept. 12, 1876	17	10
Best, Wesley Erastus	Illinois	Sept. 11, 1876	17	1
Biddle, John Craig	Pennsylvania	Sept. 20, 1875	16	1
Bishop, Lot Clarke	Ohio	June 21, 1876	17	10
Bliss, Herbert	Rhode Island	Sept. 15, 1875	16	7
Blow, George Preston	Virginia	Sept. 14, 1876	15	11
Bonfils, Thomas Lewis	Missouri	June 19, 1875	17	8
Bowdon, Frank Welch	Texas	Sept. 11, 1875	17	7
Brainard, Frederick Roland	Illinois	June 21, 1876	17	9
Brinley, Edward		Sept. 18, 1876	16	3
Bronner, Edmund Devening	New York	Sept. 11, 1876	17	7
Brown, James Stephen	Tennessee	Sept. 11, 1875	17	2
Bryan, Samuel	Maryland	June 14, 1876	17	3
Bullitt, Howard Henry	Kentucky	Sept. 11, 1875	17	11
Cabanis, Charles	Virginia	June 21, 1876	16	8
Clark, Lewis Jacob	Alabama	Sept. 11, 1876	14	7
Cockle, Rudolphus Rouse	Illinois	June 21, 1875	17	8
Conness, David Colebern Brodrick		Sept. 11, 1876	17	5
Cooke, Abbot Stanislaus	Illinois	Sept. 11, 1876	17	2
Cooke, Paul Byram	New York	Sept. 13, 1875	16	4
Cooper, Robert John	Indiana	Sept. 13, 1875	17	8
Craig, Ben Holliday	Missouri	June 14, 1876	16	8
Craven, Macdonough	New York	June 21, 1876	17	7
Deal, Edwin Peter	Missouri	June 14, 1876	17	2
Dent, Sydney Hope	District of Columbia	Sept. 11, 1876	15	7
Dewey, Theodore Gibbs	At large	June 19, 1875	16	0
Dickson, Joseph Morrill	Texas	June 14, 1876	15	5
Dillman, George Lincoln	Iowa	June 19, 1876	16	1
Doyen, Charles Augustus	New Hampshire	June 21, 1876	16	9
Drake, James Calhoun	Arkansas	June 19, 1875	17	11
Dresel, Herman George	Ohio	Sept. 18, 1876	17	8
Duncan, Louis		Sept. 11, 1876	15	6
Eldridge Houston		Oct. 2, 1876	15	7
Emerson, William Henry		Oct. 10, 1876	16	4
Emmett, William LeRoy		June 26, 1876	16	11
Eyre, Manning Kennard	Rhode Island	Sept. 11, 1876	15	6
Fillebrown, Horatio Ladd	South Carolina	June 19, 1875	16	1
Finley, Henry Marzette	Ohio	June 21, 1875	16	5
Firestone, Allison Deford	Indiana	June 21, 1876	17	2
Forshew, Robert Pierpont	New York	June 21, 1876	16	11
Foster, Edward West	Tennessee	June 21, 1876	16	1

CADET-MIDSHIPMEN.

Fourth class—124 *members*—Continued.

Name.	State.	Date of admission.	Age at date of admission.	
			Yrs.	Mos.
Franklin, Thomas Baber	Tennessee	Sept. 15, 1875	17	11
Garland, John Spotswood		June 21, 1876	17	4
George, Charles Peaslee		July 1, 1876	16	3
Gilliam Donnell	North Carolina	June 21, 1876	15	8
Gray, James	Illinois	Sept. 12, 1876	17	8
Gresham, William Albert	Indiana	June 19, 1875	17	3
Haeseler, Francis Joy	Pennsylvania	Sept. 12, 1876	16	5
Haines, Henry Cargill	District of Columbia	June 26, 1875	17	7
Hains, Robert Peter		Sept. 18, 1876	16	3
Haskell, Porter David	Michigan	Sept. 12, 1876	17	4
Hasson, Alexander Ritchie	At large	June 21, 1875	15	4
Haymond, Edgar Bamford Wilson	Virginia	Sept. 13, 1876	15	6
Hill, Charles Homer	Wisconsin	Sept. 14, 1875	16	0
Hourigan, Patrick William	New York	June 21, 1876	16	7
Howze, Arthur Robertson	Mississippi	June 21, 1876	15	7
Huntoon, Fitz-Aubert	Texas	Sept. 15, 1875	16	10
Irving, Washington	New York	Sept. 14, 1875	15	0
Jackson, Samuel LeRoy	Virginia	Sept. 11, 1875	16	10
Jones, Henry George	Ohio	June 21, 1876	15	0
Jones, Richard	New Jersey	June 19, 1875	16	11
Kimball, Edward Fenno	South Carolina	June 21, 1875	15	7
Lieper, Edwards Fayssoux	Pennsylvania	June 21, 1875	16	7
Lindsey, John Howard	Pennsylvania	June 21, 1876	16	2
Mahoney, James Edward	Massachusetts	Sept. 12, 1876	16	9
Matthews, Thomas Henry	Pennsylvania	Sept. 12, 1876	16	1
Mayer, Augustus Newkirk	Iowa	June 17, 1876	17	3
McCrea, Alexander Sterling		Oct. 2, 1876	17	2
Miner, John Rice, jr	Ohio	June 21, 1876	15	10
Morgan, Stokely	Arkansas	June 14, 1876	16	11
Muir, William Carpenter Pendleton	Kentucky	June 21, 1876	17	3
Murray, James Bernard	New York	Sept. 12, 1876	16	5
Nash, Edwin White	Ohio	Sept. 11, 1876	16	11
Niblack, Albert Parker	Indiana	Sept. 12, 1876	17	2
Norton, Luman Spooner	Vermont	Sept. 12, 1876	17	0
Orlopp, Max Anton	Arkansas	June 19, 1876	17	1
Parke, Thomas Aloysius	West Virginia	June 21, 1876	16	8
Parsons, Arthur Carlton	Iowa	June 21, 1876	17	11
Patterson, Samuel Achmuty Wainwright		June 21, 1876	16	6
Perkins, Con Marrast	Georgia	Sept. 11, 1875	14	11
Perry, George Ernest	Illinois	Sept. 12, 1876	16	10
Perry, John Adams	Kansas	Sept. 11, 1876	17	1
Phelps, Harry	New Jersey	Sept. 13, 1876	15	7
Porter, John Pryor	Texas	Sept. 11, 1875	16	2
Reamer, Mark McDonald		June 27, 1876	15	0
Richardson, Walter Gates	Massachusetts	Sept. 12, 1876	16	9
Robinson, William Moody	District of Columbia	June 23, 1876	17	4
Rodgers, Guy George		Sept. 23, 1876	14	1
Rodman, Hugh	Kentucky	Sept. 13, 1875	16	8

CADET-MIDSHIPMEN.

Fourth class—124 *members*—Continued.

Name.	State.	Date of admission.	Age at date of admission.	
			Yrs.	Mos.
Rohrbacher, Joseph Hamilton	Pennsylvania	June 21, 1876	17	9
Russell, William Worthington	Maryland	Sept. 12, 1876	17	9
Safford, William Edwin	Ohio	Sept. 11, 1876	16	9
Scott, Richard Hamilton	Minnesota	June 21, 1876	17	9
Sims, William Sowden	Pennsylvania	June 21, 1876	17	8
Simpson, Edward, jr		June 21, 1876	15	9
Starkloff, Emile Arthur Von	Missouri	July 31, 1875	17	11
Taylor, John, jr	Kentucky	Jan. 15, 1876	17	11
Thatcher, Herbert Wemple	Louisiana	Sept. 11, 1876	17	1
Thompson, Edward Clinton	Pennsylvania	Sept. 13, 1875	17	4
Truxtun, William		June 21, 1876	15	3
Van Duzer, Lewis Sayre	New York	Sept. 13, 1876	15	3
Vance, Zebulon Baird	North Carolina	June 22, 1876	16	0
Wall, Francis Richardson	Mississippi	June 23, 1876	16	11
Wallace, John Thomas	Virginia	June 14, 1876	17	10
Watters, John Sproston		June 21, 1876	14	11
West, George Ernest	New York	Sept. 12, 1876	14	5
Whitfield, Jesse George	Alabama	Sept. 11, 1876	16	10
Whitwell, Samuel Elmer	South Carolina	June 21, 1876	15	7
Will, James Frederick	Iowa	Sept. 11, 1876	17	3
Williamson, Benjamin Harris	Mississippi	Sept. 11, 1876	17	8
Williamson, Samuel Hill	North Carolina	Sept. 11, 1876	17	10
Wilson, Henry Braid	New Jersey	Sept. 11, 1876	15	7
Wolfersberger, William Henry	Illinois	Sept. 12, 1876	17	7
Wood, James Edward	Alabama	Sept. 11, 1876	17	11
Worthington, Thomas		June 19, 1876	16	7
Wright, Silas Haynes	Michigan	June 28, 1876	17	10

CADET-ENGINEERS.

Graduating class, 1876—3 *members.*

Order of general merit.	Name.	State.	Date of admission.	Age at date of admission.		Order of merit in—					Number of demerits.	Sea-service in practice-ships.	
				Years.	Months.	Steam-engineering.	Electricity.	Chemistry and heat.	Applied mathematics.	French.		Months.	Days.
1	Dunning, William Batey	New York	Oct. 1, 1873	19	2	2	3	1	2	2	89	3	9
2	Stivers, Henry Hicks	New York	Oct. 1, 1873	18	0	1	1	2	1	1	86	3	9
3	Reid, Robert Ingersoll	Pennsylvania	Oct. 1, 1872	20	2	3	2	3	3	3	76	3	9

CADET-ENGINEERS.

Second class—16 *members.*

Order of annual merit.	Name.	State.	Date of admission.	Age at date of admission.		Order of merit in—					Number of demerits.	Sea service in practice-ships.	
				Years.	Months.	Mathematics.	Chemistry.	History and composition.	French.	Drawing.		Months.	Days.
6	Bartlett, Frank William	Michigan	Oct. 1, 1874	18	1	7	7	5	4	8	214	2	9
9	Bieg, Frederick Charles	Missouri	Oct. 1, 1874	18	6	9	13	10	4	9	104	2	9
*4	**Bull, Goold Hoyt**	Pennsylvania	Oct. 1, 1874	18	4	4	4	5	3	2	236	2	9
15	Burd, George Eli	Massachusetts	Oct. 1, 1874	17	5	15	12	14	10	12	120	2	9
12	Cooley, Mortimer Elwyn	New York	Oct. 1, 1874	19	6	12	6	15	9	5	155	2	9
16	Dungan, Horace Greeley	Iowa	Oct. 1, 1874	20	6	14	16	17	17	15	168	2	9
8	Gage, Howard	Michigan	Oct. 1, 1874	18	1	10	5	7	10	10	220	2	9
10	Gow, John Loudon	Indiana	Oct. 1, 1874	18	4	8	9	9	13	14	136	2	9
7	Griffin, Robert Stanislaus	Virginia	Oct. 1, 1874	17	0	6	9	11	4	11	105	2	9
*1	**Hollis, Ira Nelson**	Kentucky	Oct. 1, 1874	18	6	1	1	1	2	1	185	2	9
13	Ivers, Henry King	Missouri	Oct. 1, 1874	18	6	16	13	8	15	6	123	2	9
5	McElroy, George Wightman	Michigan	Oct. 1, 1874	16	6	5	8	12	12	7	243	2	9
*2	**Schell, Franklin Jacob**	Pennsylvania	Oct. 1, 1874	17	1	3	2	2	1	13	116	2	9
*3	**Spangler, Harry Wilson**	Pennsylvania	Oct. 1, 1874	16	9	2	3	3	7	3	143	2	9
14	Wight, Charles Leslie	Massachusetts	Oct. 1, 1874	21	1	13	11	13	16	4	223	2	9
11	Wilmer, Joseph Ringgold	Maryland	Oct. 1, 1874	20	10	11	15	4	6	17	99	2	9

CADET-ENGINEERS.

Third class—28 *members.*

Order of annual merit.	Name.	State.	Date of admission.	Age at date of admission.		Order of merit in—				Number of demerits.	Sea-service in practice ships.	
				Years.	Months.	Mathematics.	French.	History and composition.	Drawing.		Months.	Days.
16	Acker, Edward O'Connor	Pa	Sept. 15, 1875	17	4	16	28	8	7	52	2	20
7	Annan, John Wesley	Mass	Sept. 15, 1875	19	0	12	5	6	15	125	2	20
24	Baker, John Howard	R. I	Sept. 15, 1875	18	0	26	15	22	20	75	2	20
19	Bartholow, Frank Lamotte	Ohio	Sept. 15, 1875	18	8	21	19	17	24	71	2	20
5	Bennett, Frank Marion	Mich	Oct. 1, 1874	17	5	5	17	3	12	217	2	20
23	Bevington, Martin	Ohio	Sept. 15, 1875	17	10	22	24	21	18	114	2	20
4	Bowles, Francis Tiffany	Mass	Sept. 15, 1875	16	11	4	4	4	10	56	2	20
25	Bowers, Frederic Clay	N. J	Sept. 15, 1875	17	7	24	9	25	26	94	2	20
8	Bryan, Benjamin Chambers	N. J	Sept. 15, 1875	17	1	6	11	14	14	93	2	20
15	Carr, Clarence Alfred	Pa	Sept. 15, 1875	19	1	15	12	10	29	50	2	20
27	Carter, Thomas Frederic	Ky	Oct. 1, 1873	21	0	28	26	26	17	41	2	20
18	Crygier, John Ulysses	N. Y	Oct. 1, 1874	16	6	17	29	13	10	157	2	20
9	Elseffer, Harry Smith	Iowa	Oct. 1, 1874	19	3	9	8	11	4	168	2	20
*1	**Gatewood, Richard**	Va	Sept. 15, 1875	15	11	1	1	1	13	70	2	20
11	Harrison, Henry Fillmore	Md	Oct. 1, 1874	18	9	13	13	9	18	91	2	20
17	Hogan, Thomas Joseph	Ga	Oct. 1, 1874	18	10	18	15	12	2	111	2	20
6	Hunt, Andrew Murray	Ind	Sept. 15, 1875	16	2	10	6	7	9	96	2	20
26	Isbester, Richard Thornton	Tenn	Sept. 15, 1875	18	3	26	21	20	22	262	2	20
10	Lubbe, Charles Bethel	Pa	Sept. 15, 1875	18	3	7	18	14	4	91	2	20
*2	**McFarland, Walter Martin**	D. C	Sept. 15, 1875	16	1	2	2	2	20	62	2	20
22	Mercier, David Isaiah	Va	Sept. 15, 1875	19	1	20	26	19	23	207	2	20
3	Noell, Michael Daniel	Pa	Sept. 15, 1875	17	5	3	10	4	8	143	2	20
12	Norton, Harold Percival	N. Y	Oct. 1, 1874	18	10	13	14	18	1	80	2	20
14	Salisbury, George Robert	Miss	Oct. 1, 1874	19	7	7	19	24	16	57	2	20
13	Scribner, Edward Herschell	Mass	Oct. 1, 1874	19	11	11	7	23	3	106	2	20
28	Smith, William Strother	Va	Sept. 15, 1875	18	0	23	22	29	25	127	2	20
21	Talcott, Charles Gratiot	Va	Sept. 15, 1875	16	0	18	23	27	6	113	2	20
20	Yarnall, John Hepburn	D. C	Sept. 15, 1875	19	1	24	3	14	27	82	2	20

CADET-ENGINEERS.

Fourth class—26 *members.*

Name.	State.	Date of admission.	Age at date of admission.		Relative standing determined at examination for appointment.
			Years.	Months.	
Allderdice, William Hillary	Pennsylvania	Sept. 14, 1876	16	9	2
Arnold, Solon	Maryland	Sept. 14, 1876	22	2	23
Bailey, Horace Justus	District of Columbia	Sept. 14, 1876	18	11	16
Belden, Charles Emory	Ohio	Sept. 14, 1876	18	6	20
Byrne, James Edwin	Massachusetts	Sept. 14, 1876	19	5	19
Durand, William Frederick	Connecticut	Sept. 14, 1876	17	6	7
Eckel, Herman	Ohio	Sept. 14, 1876	20	2	25
Hall, Harry	Pennsylvania	Sept. 14, 1876	17	9	22
Hasson, William Frederick Converse	Ohio	Sept. 14, 1876	19	4	8
King, Charles Alfred	Maryland	Sept. 14, 1876	18	1	3
Kinkaid, Thomas Wright	Ohio	Sept. 14, 1876	16	6	15
Lang, William	New York	Sept. 14, 1876	18	8	12
Lillebridge, Frederick May	Connecticut	Sept. 14, 1876	17	9	21
Manning, Charles Edward	New York	Sept. 14, 1876	17	6	13
Mathews, Clarence Herbert	Ohio	Sept. 14, 1876	19	7	11
Miner, Leo Dwight	Ohio	Sept. 14, 1876	17	7	9
Nichols, Arthur	New York	Sept. 14, 1876	19	5	5
Sample, Winfield Scott	Pennsylvania	Sept. 14, 1876	18	10	10
Smith, Albert Edward	Wisconsin	Sept. 14, 1876	17	8	6
Stahl, Albert William	New York	Sept. 14, 1876	19	4	1
Temple, Arthur Wallace §	Massachusetts	Sept. 15, 1875	20	9	1
Weaver, William Dixon	Kentucky	Sept. 14, 1876	19	1	24
Wood, Joseph Learned	Virginia	Sept. 14, 1876	20	2	4
Woods, Arthur Tannatt	Massachusetts	Sept. 14, 1876	17	7	18
Worthington, John Leeds	Maryland	Sept. 14, 1876	18	3	14
Young, Albert Osborn	New York	Sept. 14, 1876	19	2	17

§ On sick leave.

SUMMARY.

Academic year 1876-77.

CADET-MIDSHIPMEN.

First class	46 members.	
Second class	43 members.	
Third class	59 members.	
Fourth class	124 members.	
		272

CADET-ENGINEERS.

Second class	16 members.	
Third class	28 members.	
Fourth class	26 members.	
		70
Total		342

Students from the Empire of Japan are received for instruction under a resolution of the Senate and House of Representatives of the United States approved July 27, 1868.

RESIGNATIONS, DISMISSALS, AND DEATHS.

RESIGNATIONS.

Cadet-Midshipman Fletcher Hodges	Oct.	14, 1875
Cadet-Midshipman Henry C. Jones	Oct.	27, 1875
Cadet-Midshipman William S. Winchester	Nov.	11, 1875
Cadet-Midshipman Joseph L. Redfern	Nov.	30, 1875
Cadet-Midshipman William F. Eudress	Dec.	16, 1875
Cadet-Midshipman William Morse	Jan.	4, 1876
Cadet-Engineer Henry O'Connor	Jan.	17, 1876
Cadet-Midshipman William Crosby	Feb.	2, 1876
Cadet-Midshipman John P. Boyd	Feb.	2, 1876
Cadet-Midshipman Alfred G. Morey	Feb.	2, 1876
Cadet-Midshipman Andrew S. Rowan	Feb.	5, 1876
Cadet-Midshipman David Bartlett	Feb.	5, 1876
Cadet-Midshipman Howard C. Boon	Feb.	5, 1876
Cadet-Midshipman Frederick P. Meares	Feb.	5, 1876
Cadet-Midshipman George H. R. Preble	Feb.	5, 1876
Cadet-Midshipman George D. Donnelly	Feb.	29, 1876
Cadet-Midshipman E. B. W. Haymond	March	8, 1876
Cadet-Midshipman W. O'N. P. Maury	March	29, 1876
Cadet-Midshipman A. W. Buffington	April	24, 1876
Cadet-Midshipman William W. Russell	May	17, 1876
Cadet-Midshipman James A. Schrum	May	20, 1876
Cadet-Midshipman Mark C. Castle	May	24, 1876
Cadet-Midshipman Lewis C. Fletcher	May	24, 1876
Cadet-Midshipman George H. Hess	May	24, 1876
Cadet-Midshipman John G. Mason	May	24, 1876
Cadet-Midshipman Lyman B. Messinger	May	24, 1876
Cadet-Midshipman William B. Osterhout	May	24, 1876
Cadet-Midshipman Arthur B. Tracy	May	24, 1876
Cadet-Midshipman James D. Sheeks	May	24, 1876
Cadet-Midshipman Charles S. Williams	May	24, 1876
Cadet-Midshipman E. O. C. Ord	June	20, 1876
Cadet-Midshipman H. F. Grabo	June	23, 1876
Cadet-Midshipman A. C. Macomb	June	23, 1876
Cadet-Midshipman E. D. Fitzgerald	June	23, 1876
Cadet-Midshipman James Gray	June	23, 1876
Cadet-Midshipman E. H. Offley	June	23, 1876
Cadet-Midshipman R. J. Breckinridge	June	23, 1876
Cadet-Midshipman H. D. Booth	June	23, 1876
Cadet-Midshipman A. C. Gilmore	June	23, 1876
Cadet-Midshipman Leonidas Levisee	June	23, 1876
Cadet-Midshipman James O'Connell	June	23, 1876
Cadet-Midshipman A. N. Paxton	June	23, 1876
Cadet-Engineer C. A. Miller	June	23, 1876
Cadet-Midshipman Nat. Saunders	Sept.	28, 1876
Cadet-Engineer J. M. Pickrell	Sept.	28, 1876

WITHDRAWN.

Japanese student Keizero Machida	Jan.	3, 1876
Japanese student Kantaro Arima	July	28, 1876

DISMISSALS.

Cadet-Midshipman Lovell H. Webb	Oct.	26, 1875
Cadet-Midshipman Chester A. Mayer	Oct.	26, 1875
Cadet-Midshipman Thomas Dickinson	Nov.	4, 1875
Cadet-Midshipman Henry E. Baker	Nov.	4, 1875
Cadet-Midshipman Stuart Aldrich	March	14, 1876
Cadet-Midshipman Campbell M. Johnston	March	14, 1876
Cadet-Midshipman David W. Jones	June	23, 1876
Cadet-Midshipman John T. McNasser	June	23, 1876
Cadet-Midshipman Albert N. Wood	Sept.	7, 1876

DEATHS.

Cadet-Midshipman John P. Arnold	July	18, 1876

ACCEPTANCE OF RESIGNATIONS REVOKED.

Cadet-Midshipman W. L. Todd	Oct.	18, 1875
Cadet-Engineer T. F. Carter	Dec.	21, 1875

ADMITTED AFTER THE PUBLICATION OF THE REGISTER FOR 1875–76.

Cadet-Engineer Clarence Alexander Miller, of Virginia	Oct.	27, 1875

ANNUAL RIFLE-MATCH.

GRADUATING CLASS, JUNE, 1876.

Target, class No. 1, United States Navy.
Distance, 400 yards.
Position, skirmisher, lying, natural rest.
Piece, Remington navy rifle.

Number of shots, 7.
Highest score possible, 28.
Centre counting 4, inner 3, and outer 2.

	1.	2.	3.	4.	5.	6.	7.	Total.
T. D. Griffin	4	4	3	3	4	4	4	26
S. J. Brown	3	4	2	4	4	4	3	24
J. C. Gillmore	4	4	3	4	4	2	3	24
H. T. Mayo	2	4	4	3	4	3	4	24
W. D. Rose	3	4	3	2	3	4	4	23

Total number of points made by the class of 42 members 680
Average 16.2

SUMMER-CRUISE, 1876.

OFFICERS AND CADET-MIDSHIPMEN

ATTACHED TO THE

UNITED STATES PRACTICE-SHIP CONSTELLATION.

Commander EDWARD TERRY, *Commanding.*
Lieutenant-Commander SILAS W. TERRY, *Executive Officer.*
Lieutenant-Commander B. H. McCALLA, *Navigator.*
Lieutenant J. H. DAYTON, *Senior Watch-Officer.*
Lieutenant H. KNOX, *Watch-Officer.*
Lieutenant C. P. PERKINS, *Watch-Officer.*
Lieutenant W. P. POTTER, *Watch-Officer.*
Ensign W. H. SOUTHERLAND, *Watch-Officer.*
Ensign J. M. ROPER, *Watch-Officer.*
Ensign A. M. KNIGHT, *Watch-Officer.*
Surgeon H. N. BEAUMONT.
Assistant Surgeon D. N. BERTOLETTE.
Paymaster W. GOLDSBOROUGH.
Chaplain G. W. SMITH.
Boatswain ANDREW MILNE.
Gunner ROBERT SOMMERS.
Clerk to Commandant of Cadets C. M. McLEOD.
Paymaster's Clerk JAMES McGREGOR.

CADET-MIDSHIPMEN.

First class (47).

W. S. Benson.	O. S. Dodge.	A. Jeffries.	W. R. Rush.
F. M. Bostwick.	H. M. Dombaugh.	H. A. Johnson.	H. Taylor.
J. K. Brice.	H. O. Dunn.	J. N. Jordan.	F. W. Toppan.
W. V. Bronaugh.	A. F. Fechteler.	K. Katz.	H. C. Wakenshaw.
T. M. Brumby.	W. F. Fullam.	J. G. Kunitomo.	P. J. Werlich.
W. L. Burdick.	A. Gleaves.	B. V. Lansdale.	J. C. Wilson.
F. B. Case.	A. W. Grant.	V. S. Nelson.	A. G. Winterhalter.
S. Cook.	A. L. Hall.	J. H. Oliver.	H. M. Witzel.
W. M. Constant.	N. J. L. T. Halpine.	J. M. Orchard.	A. N. Wood.
W. G. David.	H. W. Harrison.	R. C. Paris.	S. E. Woodworth.
G. W. Denfeld.	F. R. Heath.	J. P. Parker.	E. E. Wright.
A. W. Dodd.	B. W. Hodges.	H. H. Rogers.	

Second class (2).

W. L. Rodgers. A. G. Rogers.

Third class (58).

A. W. Barkley.	G. R. French.	J. F. Luby.	W. J. Sears.
L. H. Barnard.	L. M. Garrett.	R. F. Lopez.	R. S. Sloan.
J. Beale.	L. O. Garrett.	C. C. Marsh	T. Snowden.
J. A. Bell.	J. H. Gibbons.	W. J. Maxwell.	H. L. Sturdivant.
O. H. P. Belmont.	J. Gibson.	D. P. Menefee.	F. Swift.
R. O. Bitler.	W. A. Gill.	R. H. Miner.	W. A. Thom.
J. B. Blish.	M. C. Gorgas.	J. M. Moore.	E. H. Tillman.
G. W. Brown.	W. A. Graham.	J. A. Mudd.	E. B. Webster.
W. W. Buchanan.	C. H. Harlow.	C. C. Norris.	G. S. Welsh.
H. S. Chase.	G. E. Harrison.	F. B. Parsons.	E. Wilkinson.
A. B. Clements.	E. E. Hayden.	M. L. Read.	H. Wike.
A. Cramer.	J. Hood.	C. S. Ripley.	F. A. Woodworth.
A. C. Cunningham.	C. W. Jungen.	H. J. Robinson.	
J. A. Dougherty.	F. W. Kellogg.	R. P. Schwerin.	
P. L. Drayton.	W. N. King.	S. A. Scott.	

The Constellation sailed from Annapolis Roads, June 26, for New York City; from thence to New Bedford, Buzzard's Bay, Vineyard Haven, Mass, and Newport, R. I., and arrived at the Naval Academy September 14, 1876.

UNITED STATES PRACTICE-STEAMER MAYFLOWER.

Commander H. L. HOWISON, *Commanding.*
Lieutenant DUNCAN KENNEDY.
Lieutenant T. B. M. MASON.
Passed Assistant Surgeon A. M. MOORE.
Passed Assistant Engineer W. L. NICOLL.
Passed Assistant Engineer DAVID JONES.

CADET-ENGINEERS.

Third class (28).

E. O'C. Acker.	F. C. Bowers.	H. F. Harrison.	M. D. Noell.
J. W. Annan.	B. C. Bryan.	T. J. Hogan.	H. P. Norton.
J. H. Baker.	C. A. Carr.	A. M. Hunt.	G. R. Salisbury.
F. L. Bartholow.	T. F. Carter.	R. T. Isbester.	E. H. Scribner.
F. M. Bennett.	J. U. Crygier.	C. B. Lubbe.	W. S. Smith.
M. Bevington.	H. S. Elseffer.	W. M. McFarland.	C. G. Talcott.
F. T. Bowles.	R. Gatewood.	D. I. Mercier.	J. H. Yarnall.

The Mayflower left her anchorage June 26, and accompanied the Constellation to sea; proceeded thence to the navy-yards at Norfolk, Va., and League Island; touched at Philadelphia and Chester, Pa., Edgemoore and Wilmington, Del., the navy-yard, New York, New Bedford, and Vineyard Haven, Mass., Newport Torpedo Station and Providence, R. I., New London, Conn., Cold Springs, and Newburgh, returning to New York City, sailed thence for the Chesapeake, and arrived at Annapolis September 15, 1876.

Table of coefficients to be applied to the final averages in each branch in preparing the merit-rolls.

CADET-MIDSHIPMEN.

Department.	Subject.	Coefficients. First year—fourth class.	Second year—third class.	Third year—second class.	Fourth year—first class.	Graduating maximum for required studies.
Seamanship	Seamanship	.....	.....	12	12	136
	Naval Construction	.....	.....	.....	8	
	Naval Tactics	.....	.....	2	.....	
Ordnance and Gunnery	Ordnance Instructions	.....	.....	3	.....	76
	Infantry Tactics	.....	.....	2	.....	
	Ordnance and Armor	.....	.....	.....	14	
Mathematics	Algebra and Geometry	9	.....	.....	.....	108
	Trigonometry, Analytical Geometry, and Descriptive Geometry	.....	18	.....	.....	
Steam-Engineering	Marine Engines	.....	.....	.....	12	48
Astronomy, Navigation, and Surveying	General Astronomy	.....	.....	6	.....	88
	Navigation and Surveying	.....	.....	.....	16	
Physics and Chemistry	Physics and Chemistry	.....	8	.....	.....	88
	Electricity	.....	.....	6	.....	
	Light and Heat	.....	.....	.....	8	
Mechanics and Applied Mathematics	Mechanics and Applied Mathematics	.....	.....	14	.....	56
English Studies, History, and Law	English and History	6	.....	.....	.....	80
	History and Rhetoric	.....	6	.....	.....	
	Composition	.....	.....	5	.....	
	Public Law	.....	.....	.....	3	
Modern Languages	French	2	4	4	.....	64
	Spanish	.....	.....	3	3	
Drawing	Line-Drawing and Topography	2	.....	.....	.....	16
	Sketching	.....	2	.....	.....	
Maximum for each year		76	152	228	304	760
Deduction for each demerit		.004	.007	.013	.03	.....

CADET-ENGINEERS.

Seamanship	Naval Construction	.....	.....	.....	8	32
Mathematics	Algebra and Geometry	9	.....	.....	.....	108
	Trigonometry, Analytical Geometry, and Descriptive Geometry	.....	18	.....	.....	
Steam-Engineering	Mechanical Drawing	2	2	.....	.....	236
	Fabrication of Machinery	.....	.....	19	36	
	Designing of Machinery					
	Marine Engines					
Astronomy, Navigation, and Surveying	General Astronomy	.....	.....	6	.....	24
Physics and Chemistry	Physics and Chemistry	.....	8	.....	.....	116
	Electricity	.....	.....	6	.....	
	Light and Heat	.....	.....	.....	8	
	Physical Measurements	.....	.....	.....	7	
Mechanics and Applied Mathematics	Mechanics and Applied Mathematics	.....	.....	14	.....	100
	Mechanics	.....	.....	.....	11	
English Studies, History, and Law	English and History	6	.....	.....	.....	80
	History and Rhetoric	.....	6	.....	.....	
	Composition	.....	.....	5	.....	
	Public Law	.....	.....	.....	3	
Modern Languages	French	2	4	4	.....	64
	Spanish	.....	.....	3	3	
Maximum for each year		76	152	228	304	760
Deduction for each demerit		.004	.007	.013	.03	.....

MERIT-ROLLS FOR 1875-76.

Merit-rolls, made out yearly for each class, show the proficiency of the Cadets in each branch of study. The numbers given in the preceding table, showing the relative weight of the different branches, are used as coefficients; the final mark in each branch (on a scale of 4) being multiplied by the number assigned to that branch. The sum of the products, after making deductions for conduct, is the final mark of the Cadet for the year.

In the case of Cadets who take an elective course in any branch, the final mark in that branch is determined by adding to the final mark received in the required course one-fifth of the amount by which the final mark in the elective course exceeds 2.50.

In the graduating merit-roll, the final mark for the course is determined by the sum of the four yearly marks.

"Cadets who attain 85 per cent. of the multiple in any year shall be distinguished by a star affixed to their names on the merit-rolls."—(Regulations U. S. Naval Academy, § 150.)

Cadets whose names are marked thus (†) were found deficient, but were allowed to continue in their classes on condition of passing at a re-examination.

Those marked thus (‡) were found deficient, and turned back, to recommence the studies of their respective classes.

Those marked thus (§) were found deficient, and recommended to be dropped.

a denotes absence from examination.

Merit-roll of first class (42 members), annual examination, June, 1876, and general merit-roll for four years.

Order of general merit.	Name.	Seamanship.	Practical exercises.	Naval architecture.	Ordnance and armor.	Steam-engineering.	Navigation.	Light and heat.	Public law.	Spanish.	Conduct.	Aggregate for fourth year.	Aggregate for third year.	Aggregate for second year.	Aggregate for first year.	General aggregate for four years.
	Maxima	48	20	24	52	44	60	32	12	12		304	228	196.30	87.79	816.09
*1	**Stimson J. Brown**	40.08	16.25	21.84	46.67	38.94	52.20	27.84	10.32	10.53	3.57	261.10	194.54	170.48	81.03	707.15
*2	**Henry C. Gearing**	41.28	16.50	20.40	46.15	35.97	52.80	27.68	10.44	8.85	4.35	255.72	193.24	167.44	78.62	695.02
3	George C. Foulk	41.16	19.25	21.12	45.89	37.18	50.25	24.40	9.78	9.33	1.38	256.98	193.68	163.55	73.48	687.69
4	Burns T. Walling	42.00	16.90	21.36	41.21	37.40	49.65	25.52	9.90	9.12	4.23	248.83	187.40	166.02	77.31	679.56
5	Templin M. Potts	42.24	17.90	19.86	43.55	35.75	47.40	24.88	9.75	9.81	4.77	246.37	185.60	164.21	80.27	676.45
6	William H. Allen	40.44	16.90	20.64	43.42	33.55	49.80	26.08	10.26	9.48	2.55	248.02	185.35	164.21	73.20	670.78
7	James H. Sears	40.44	17.65	20.16	40.56	36.63	47.55	23.68	9.60	8.31	3.99	240.59	180.44	165.26	75.11	661.40
8	Stephen Jenkins	37.92	17.75	19.02	42.25	35.53	46.95	21.84	10.83	8.73	3.36	237.46	185.28	161.33	75.15	659.22
9	Thomas G. Winch	41.52	17.90	22.26	41.46	34.10	48.30	23.44	9.87	8.70	2.70	247.85	179.43	155.70	73.80	656.78
10	Clifford J. Boush	40.80	19.25	19.92	43.16	35.31	44.55	22.56	9.00	7.95	2.34	240.16	180.55	161.64	73.91	656.26
11	Edward M Katz	36.84	14.90	17.76	42.12	33.99	42.30	24.08	9.87	10.05	4.74	227.17	181.60	164.49	78.47	651.73
12	Charles C. Rogers	35.16	15.15	19.20	39.78	30.47	45.90	23.84	10.26	9.21	2.55	226.42	181.43	162.29	80.85	650.99
13	Walter McLean	35.76	13.50	17.64	42.90	33.00	41.85	22.80	9.96	8.52	4.29	221.64	174.87	163.61	72.62	632.74
14	Henry T. Mayo	38.76	15.00	17.70	41.08	33.99	44.85	22.80	9.45	8.43	4.02	228.04	182.73	150.23	70.58	631.58
15	Abraham E. Culver	34.92	13.40	18.54	39.39	28.38	51.15	24.64	10.08	8.97	2.97	226.50	178.48	150.60	73.33	628.91
16	Lovell K. Reynolds	41.64	18.25	20.76	39.65	34.43	41.55	24.68	9.36	8.40	4.50	231.22	175.01	154.16	67.73	628.12
17	William L. Varnum	42.96	19.00	18.36	40.01	33.66	43.05	20.80	9.27	7.95	3.60	231.49	173.17	153.52	69.32	627.50
18	Richard Henderson	36.48	15.65	18.72	39.78	33.33	50.10	23.04	8.46	8.52	2.22	231.86	176.50	142.36	67.08	617.80
19	Charles F. Pond	34.44	13.65	17.04	38.74	32.34	46.35	23.20	9.33	8.88	4.95	219.02	172.00	150.45	74.94	616.41
20	Anthony W. Rollins	38.16	13.25	17.88	37.96	30.80	45.90	23.84	9.12	8.31	3.27	221.95	169.44	151.72	64.26	607.37
21	Robert C. Ray	35.64	15.65	16.62	39.91	33.33	40.95	21.20	8.70	8.19	3.03	217.16	168.38	147.26	74.09	606.89
22	John T. Newton	36.48	16.25	16.56	37.83	31.24	39.90	21.68	8.70	10.11	4.71	214.04	163.60	158.87	68.44	604.95
23	William D. Rose	35.16	13.50	19.20	44.33	33.00	46.35	24.40	9.69	8.43	3.21	230.85	166.34	141.09	63.81	602.09
24	James C. Gillmore	36.24	14.90	17.22	37.70	31.90	41.40	21.76	8.07	8.25	1.86	215.58	162.35	150.28	67.58	595.79
25	Augustus E. Jardine	37.20	15.90	17.58	38.35	29.59	41.55	20.80	9.12	8.43	2.22	216.30	175.12	142.97	60.20	594.59
26	Daniel R. Case	37.32	14.25	17.64	38.74	33.99	43.80	20.80	8.55	8.55	4.41	219.23	158.41	140.03	70.50	588.17
27	Stevenson B. Mallory	36.60	13.75	18.78	38.48	31.35	46.65	23.92	9.45	8.46	3.48	223.96	163.56	137.43	57.50	582.45
28	Washington I. Chambers	37.08	17.25	19.32	38.61	31.90	41.10	18.56	7.86	8.01	4.59	215.10	164.89	134.47	67.90	582.36
29	Francis H. Sherman	35.16	15.15	16.14	38.09	32.12	42.15	21.36	8.73	8.28	3.00	214.18	158.73	140.68	66.25	579.84
30	Charles A. Govo	37.68	15.65	18.24	34.97	30.47	41.40	18.00	8.31	8.22	4.14	208.80	159.62	145.40	63.43	577.25
31	Louis W. Piepmeyer	35.64	16.00	16.38	35.75	30.25	42.30	21.28	10.29	8.88	2.85	213.92	156.26	138.33	68.51	577.02
32	De Witt Coffman	36.72	15.15	17.76	37.18	35.20	39.60	20.40	8.73	8.07	2.91	215.90	159.83	139.31	61.42	576.49

33	Benjamin Tappan	37.32	14.15	15.84	36.92	31.13	42.60	20.64	10.26	7.98	3.90	212.91	161.50	136.96	64.94	576.34
34	John M. Proudfit	37.56	15.65	16.80	36.40	31.79	45.60	17.84	8.04	8.19	3.75	214.12	153.21	141.10	65.59	574.02
35	Henry Minett	34.44	14.65	17.16	37.57	32.01	42.60	20.32	7.71	9.00	4.53	207.93	157.72	137.63	67.10	570.38
36	William G. Hannum	34.20	13.75	15.78	37.31	34.57	41.70	22.08	8.73	8.40	3.42	210.10	162.26	140.01	57.04	569.41
37	Richard T. Mulligan	35.28	14.40	16.74	36.27	31.79	39.45	20.88	8.31	8.16	2.97	208.31	162.53	133.58	63.80	568.25
38	William S. Hogg	32.61	13.40	15.72	34.06	32.12	39.90	21.76	8.22	8.70	3.78	202.74	157.96	139.16	63.62	563.48
39	Elstner N. Fisher	33.96	12.90	16.74	36.66	32.45	40.80	23.76	8.10	8.07	4.89	208.55	155.74	127.64	59.88	551.81
40	Edward E. Wise	33.00	12.40	16.56	35.23	31.02	39.30	19.04	8.58	7.92	4.53	198.52	156.90	135.91	58.91	550.24
41	Thomas D. Grillin	33.24	14.25	15.30	33.11	27.83	38.25	21.28	8.10	8.82	1.89	198.59	155.45	134.46	61.47	549.97
1	William Brannersrouther	35.88	17.40	15.84	35.10	29.70	34.50	18.08	8.19	8.07	4.11	198.95	152.86	149.73	53.03	554.57

Merit-roll of second class (54 members), annual examination, June, 1876.

Order of annual merit.	Name.	Seamanship.	Naval tactics.	Ship-building.	Infantry tactics.	Astronomy.	Electricity.	Applied mathematics.	English composition.	French.	Spanish.	Conduct.	Aggregate.
	Maxima	**28.00**	**8.00**	**16.00**	**8.00**	**24.00**	**40.00**	**56.00**	**20.00**	**16.00**	**12.00**		**228.00**
*1	**William F. Fullam**	25.83	7.26	13.60	7.28	22.26	35.40	49.00	17.80	12.56	9.27	1.61	198.65
*2	**Hiero Taylor**	22.61	6.64	13.76	6.42	21.18	36.20	50.82	16.20	12.52	9.84	1.30	194.89
3	Russell C. Paris	20.16	6.40	11.92	6.72	20.94	35.00	52.08	17.15	14.48	10.62	2.25	193.22
4	Horace M. Witzel	23.45	6.72	13.04	7.08	21.72	35.30	50.26	15.25	12.84	9.39	2.12	192.93
5	John M. Orchard	23.73	7.16	12.96	7.30	20.52	36.00	44.38	15.20	12.84	8.97	2.26	186.80
6	Omenzo G. Dodge	25.97	7.04	12.60	6.82	22.20	34.80	43.12	14.30	10.72	8.82	1.25	185.14
7	William G. David	21.14	6.76	13.08	6.70	21.54	32.60	44.38	17.70	13.24	9.36	1.95	184.55
8	Albert G. Winterhalter	21.70	5.96	12.32	6.92	20.58	30.40	45.22	17.15	14.88	10.71	1.59	184.25
9	Alfred Jeffries	24.71	7.08	12.40	6.26	18.66	32.30	40.46	15.85	13.52	10.23	0.77	180.70
10	William V. Bronaugh	20.37	6.64	11.48	5.86	20.88	33.70	45.92	15.55	11.80	8.40	2.47	178.13
11	John N. Jordan	24.71	6.76	12.16	6.74	18.24	32.30	41.02	14.80	12.56	9.84	2.53	176.60
12	Jonathan K. Brice	20.58	5.62	12.24	6.02	20.28	35.50	40.32	15.70	10.72	8.52	2.46	173.04
13	Augustus F. Fechteler	21.00	6.58	10.56	5.78	19.68	27.90	42.70	17.80	13.24	9.30	2.40	172.14
14	Frank M. Bostwick	19.81	5.30	11.68	5.98	20.88	31.00	37.52	17.30	11.76	9.27	2.65	167.85
15	Thomas M. Brumby	20.30	6.46	11.04	5.76	18.84	34.10	36.82	16.70	11.48	8.52	2.25	167.77
16	Edward E. Wright	23.45	6.02	10.60	5.74	18.06	27.90	39.34	15.95	12.80	9.33	1.70	167.49
17	Albert N. Wood	21.49	5.80	11.56	6.46	21.36	28.50	37.80	16.70	11.00	8.82	2.50	166.69
18	James P. Parker	20.86	5.98	11.28	6.26	18.90	26.90	37.10	18.25	12.72	9.63	1.47	166.41
19	Selim E. Woodworth	22.19	5.86	11.48	5.96	15.96	29.20	35.84	18.15	13.40	9.87	1.94	165.97
20	Harry C. Wakenshaw	22.05	7.00	10.88	6.68	17.34	28.40	37.94	15.05	12.36	8.86	1.70	164.88
21	Walter M. Constant	22.54	5.92	12.24	6.20	19.26	28.10	39.48	12.95	11.08	8.55	2.12	164.20
22	Henry H. Rogers	21.14	6.18	10.84	5.78	19.32	29.80	35.84	15.85	11.40	8.73	0.97	163.91
23	James H. Oliver	21.14	6.42	10.32	5.18	17.70	28.40	38.50	16.10	11.96	9.87	2.09	163.50
24	Valentine S. Nelson	19.67	5.50	10.60	6.68	18.78	30.30	37.52	15.05	11.16	9.21	2.08	162.39
25	Albert Gleaves	22.26	5.52	12.40	5.80	18.78	28.90	36.82	14.25	10.64	8.49	2.63	161.23
26	Augustus C. Macomb	22.89	5.62	10.52	5.86	16.92	27.00	38.92	16.05	11.00	9.06	2.99	160.85
27	Benjamin W. Hodges	18.62	5.78	10.60	6.20	17.88	28.60	36.82	15.95	12.00	9.63	1.60	159.88
28	Herbert O. Dunn	20.51	5.66	11.72	5.86	18.06	28.80	37.28	14.30	10.84	8.49	2.11	159.54
29	Albert W. Grant	21.00	6.32	11.88	5.84	18.72	26.30	38.22	13.80	10.72	8.64	1.94	159.50
30	Philip Van H. Lansdale	20.65	5.86	10.92	5.38	17.40	30.60	37.52	13.70	10.24	8.31	1.35	159.23
31	Frank W. Toppan	21.28	5.96	11.00	5.66	17.76	29.00	35.98	14.55	11.00	8.64	1.94	158.89

32	Frank R. Heath	21.49	5.84	10.88	6.42	16.62	28.10	35.98	14.70	11.52	8.97	1.70	158.82
33	George W. Denfeld	18.90	5.50	11.08	5.78	16.80	28.80	38.50	15.80	10.60	9.18	1.78	157.16
34	Horace W. Harrison	18.62	6.46	10.08	5.71	16.74	27.60	35.84	17.80	11.72	8.73	2.77	156.56
35	Arthur W. Dodd	18.97	5.74	10.64	5.80	17.82	26.30	35.42	15.70	12.44	8.67	0.96	156.51
36	Frank B. Case	21.28	5.00	10.80	5.82	18.30	28.80	35.42	13.55	10.60	8.76	1.87	156.46
37	Henry A. Johnson	19.95	5.48	11.16	5.58	18.42	29.20	35.28	14.30	10.76	8.19	2.74	155.58
38	David W. Jones	21.35	5.88	9.36	5.00	15.90	31.30	35.14	12.95	12.68	8.25	2.85	154.96
39	Nicholas J. L. T. Halpine	21.14	6.10	10.00	5.80	17.10	25.00	35.00	14.55	13.72	9.00	2.70	154.71
40	John C. Wilson, jr	20.30	5.88	11.28	5.52	16.26	26.40	36.82	14.20	10.92	8.88	2.83	153.63
41	William R. Rush	19.04	6.10	14.36	5.46	16.44	27.00	36.40	13.95	11.32	8.37	2.64	152.80
42	William S. Benson	20.72	5.92	10.16	5.96	16.08	29.10	35.14	13.75	10.12	8.37	1.91	152.71
43	Alfred L. Hall	20.44	5.10	10.04	5.54	17.22	27.30	36.68	12.45	11.20	8.49	2.38	152.08
44	Percival J. Werlich	20.44	5.00	9.68	5.50	16.98	27.30	35.00	14.05	10.72	8.97	2.70	150.94
45	Harry M. Dombaugh	19.81	6.04	10.04	5.48	16.20	26.90	35.14	13.40	10.40	7.95	2.35	149.01
46	John H. McNasser	18.62	5.14	9.80	5.40	15.78	26.30	35.98	15.05	10.04	7.71	2.66	147.16
47	Simon Cook	17.85	5.56	8.80	5.54	15.54	25.00	35.00	14.85	10.12	8.52	1.23	145.55
48	Koroku Katz	18.62	5.24	10.32	5.84	14.58	21.40	33.46	14.40	.....	.....	2.41	121.75
49	Giro Kunitomo	18.69	5.52	10.04	5.52	14.88	18.40	35.00	14.70	.....	.....	1.52	121.23
†	George F. Ormsby	16.03	5.46	9.24	6.08	18.36	30.30	42.14	17.60	12.28	8.85	1.08	165.26
†	William L. Burdick	20.16	5.04	11.52	5.20	16.50	28.30	34.58	16.75	10.68	9.00	2.82	154.91
§	Hermann F. Grabo	17.08	6.12	10.00	4.88	17.28	25.00	37.52	16.60	11.08	9.21	1.03	154.04
§	William B. Osterhout	19.25	5.10	10.08	5.38	18.06	25.20	32.20	16.10	10.92	.....	2.30	139.99
‡	Augustus C. Almy	16.52	5.00	8.32	5.12	15.06	26.30	32.90	14.30	10.28	8.07	2.30	139.57

CADET-MIDSHIPMEN.

Merit-roll of third class (44 members), annual examination, June, 1876.

Order of annual merit.	Name.	Mathematics.	Chemistry.	History, composition, and Rhetoric.	French.	Drawing.	Conduct.	Aggregate.
	Maxima	72	32	24	16	8		152
*1	J. H. Fillmore	73.44	30.00	21.42	12.64	6.72	0.91	143.31
*2	J. H. Glennon	66.60	30.00	19.20	13.52	6.16	0.49	134.99
*3	J. G. Quinby	69.66	27.76	19.56	11.84	5.54	1.56	132.80
*4	T. S. Rodgers	65.88	26.80	20.64	14.88	5.36	0.96	132.60
5	H. S. Knapp	59.94	26.80	20.94	12.68	6.14	1.63	124.87
6	C. S. McClain	62.82	25.92	19.50	11.08	6.00	1.21	124.11
7	R. C. Smith	61.38	25.92	17.64	12.92	6.20	0.39	123.67
8	F. J. Sprague	57.42	29.04	19.92	10.92	6.54	1.76	122.08
9	H. McL. P. Huse	54.36	27.92	19.56	15.04	6.20	1.46	121.62
10	C. N. Atwater	55.26	26.08	20.70	12.44	5.80	0.87	119.41
11	J. H. L. Holcombe	52.92	27.04	19.50	12.28	5.34	0.74	116.34
12	Edward Lloyd, jr	54.18	23.28	19.74	13.32	5.78	0.52	115.72
13	Harry Kimmell	54.36	28.00	17.10	11.60	5.42	1.08	115.49
14	R. M. Hughes	54.18	25.60	20.40	11.72	5.06	1.75	115.21
15	F. L. Young	57.96	21.60	18.18	10.84	6.64	0.50	114.72
16	F. C. Skinner	51.30	25.68	18.78	11.20	6.38	1.01	112.33
17	P. B. Bibb	53.46	22.64	18.18	12.24	5.26	0.69	111.09
18	W. L. Rodgers	52.02	25.60	17.46	11.20	5.44	1.64	110.66
19	R. K. Wright	51.84	22.48	17.46	12.04	5.94	1.74	108.02
20	W. P. White	52.38	24.96	15.30	10.20	5.80	1.53	107.11
21	J. H. Shipley	50.94	22.32	17.52	11.08	5.72	1.04	106.54
22	T. W. Ryan	50.04	23.20	16.86	11.52	6.10	1.36	106.36
23	J. J. Knapp	50.22	23.36	17.94	10.12	5.10	1.13	105.61
24	J. E. McDonnell	49.32	24.72	16.14	10.68	5.30	0.66	105.50
25	J. E. Craven	50.94	22.96	15.84	10.08	5.80	1.31	104.31
26	George Sparhawk	49.68	21.20	17.58	10.60	5.94	0.88	104.12
27	S. F. B. Biddle	50.04	22.08	16.14	10.52	6.58	1.69	103.67
28	W. L. Todd	49.50	23.12	16.92	10.20	5.28	1.39	103.63
29	H. C. Poundstone	50.04	21.04	17.22	11.00	5.38	1.21	103.47
30	W. L. Canfield	48.24	20.88	17.28	11.80	6.10	0.90	103.40
31	H. H. Hooke	49.14	22.80	16.50	10.32	5.66	1.62	102.80
32	C. W. Garrett	47.52	20.80	18.18	10.48	5.12	1.41	100.69
33	B. C. Dent	47.52	22.08	16.44	10.56	5.18	1.55	100.23
34	J. H. Hetherington	47.16	21.12	16.26	10.40	5.76	1.16	99.54
35	G. R. Clark	46.08	20.56	17.46	11.36	5.16	1.69	98.93
36	R. P. Fauntleroy	46.26	20.72	16.74	10.12	6.00	1.71	98.13
37	A. D. Carrington	46.26	20.80	15.90	10.60	5.14	1.69	97.01
†	G. H. Stafford	44.46	21.92	15.06	11.04	5.40	0.62	100.26
†	A. G. Rogers	48.24	19.60	15.54	11.24	5.02	1.71	98.23
†	J. L. Purcell	46.44	20.48	16.32	9.88	5.70	1.55	97.37
†	W. E. W. Hall	46.44	20.56	15.90	9.64	5.78	1.52	96.84
†	Prentice Bailey	43.38	17.76	15.78	10.40	5.72	1.76	91.28
§	J. G. Mason	.....	20.16	.....	.....	5.48	1.21	.....
§	J. B. Cahoon	.....	.....	.....	.....	5.80	0.80	.....

CADET-MIDSHIPMEN.

Merit-roll of fourth class (69 members), annual examination, June, 1876.

Order of annual merit.	Name.	Mathematics.	English and history.	French.	Drawing.	Conduct.	Aggregate.
	Maxima	36	24	8	8		76
1	John Hood	33.30	20.16	5.88	5.66	.90	64.04
2	Frederick A. Woodworth	32.40	20.16	6.76	5.74	1.12	63.92
3	Randolph H. Miner	29.97	21.36	6.74	5.62	.96	63.43
4	Abner B. Clements	33.57	18.72	5.04	5.56	.52	62.41
5	Edward E. Hayden	28.35	21.90	6.42	6.02	.42	61.91
6	Joseph Beale	30.06	19.50	5.34	5.46	1.07	59.29
7	Charles W. Jungen	28.53	19.80	5.76	5.76	.76	59.09
8	Charles S. Ripley	29.25	17.76	5.46	6.22	.42	58.92
9	Charles C. Marsh	27.09	21.30	5.24	5.40	.56	58.47
10	Ernest Wilkinson	29.07	18.42	6.00	5.66	.42	58.39
11	John A. Bell	29.79	18.00	5.88	5.36	.67	58.36
12	Robert S. Sloan	28.98	18.12	5.42	5.76	.73	57.37
13	John M. Moore	27.18	20.70	5.22	5.10	.52	57.32
14	Henry S. Chase	27.54	18.24	5.36	5.20	.43	57.11
15	John Gibson	30.33	15.78	5.60	5.02	.54	57.09
16	Harvey Wike	30.24	17.40	5.06	5.24	1.09	56.85
17	Rennie P. Schwerin	27.81	17.94	5.60	5.92	.46	56.81
18	Herbert J. Robinson	26.91	18.78	5.60	5.90	.49	56.79
19	Louis H. Barnard	27.00	19.38	5.36	5.34	.32	56.76
20	Daniel P. Menefee	26.19	19.68	5.54	5.42	.41	56.42
21	LeRoy M. Garrett	28.08	17.28	5.54	5.54	.58	56.16
22	Andrew C. Cunningham	27.54	17.64	5.62	5.08	.16	56.04
23	John A. Dougherty	27.54	18.06	5.02	5.54	.90	55.96
24	John B. Bush	29.43	16.50	4.92	5.20	.61	55.46
25	Charles H. Harlow	25.56	20.10	5.10	5.44	1.14	55.06
26	Edward H. Tillman	28.71	16.44	4.66	5.48	.63	54.66
27	George E. Harrison	26.82	18.18	5.02	5.46	1.26	54.16
28	Henry L. Sturdevant	28.80	15.72	5.14	5.50	1.18	53.98
29	George A. Scott	26.01	15.24	4.66	5.38	.50	53.43
30	Franklin Swift	26.73	16.98	5.10	5.18	.68	53.31
31	William A. Graham	26.37	17.36	4.60	5.50	.50	53.23
32	Miles C. Gorgas	25.38	16.44	6.24	5.06	.68	53.04
33	Percival L. Drayton	25.29	16.56	6.34	5.78	1.31	52.80
34	William A. Gill	25.53	17.22	4.66	5.52	.58	52.65
35	John H. Gibbons	23.58	19.02	5.20	5.00	1.16	52.60
36	Robert F. Lopez	26.19	17.16	5.44	4.66	.94	52.51
37	Edwin B. Webster	25.74	16.86	5.18	5.78	1.12	52.44
38	Guy W. Brown	26.01	16.50	4.82	5.50	.40	52.43
39	Thomas Snowden	25.56	16.20	5.02	5.62	.24	52.22
40	Ambrose Cramer	25.83	16.32	5.02	6.04	1.07	52.14
41	Calvin C. J. Norris	25.02	16.26	5.60	5.48	.98	52.14
42	Maurice L. Read	24.39	17.82	5.14	5.50	.56	52.09
43	Francis W. Kellogg	25.20	16.86	4.88	5.32	.05	51.30
44	Oliver H. P. Belmont	25.83	15.96	5.74	5.06	1.21	51.32
45	George S. Welsh	26.37	15.54	5.02	5.22	1.15	51.10
46	Richard W. Barkley	24.03	15.96	5.06	5.72	.22	50.61
47	William A. Thom	23.31	16.32	5.02	5.02	.50	50.61
48	Walter J. Sears	23.58	17.52	4.40	5.36	.47	50.47
49	Frank B. Parsons	23.49	16.86	5.34	5.45	.75	50.39
50	Reuben O. Bitler	24.21	15.54	4.66	5.64	.23	49.82
51	John A. Mudd	24.84	17.76	4.54	5.54	1.06	49.62
52	George R. French	23.85	16.44	4.74	4.84	.40	49.47
53	Leigh O. Garrett	24.03	15.48	5.02	5.32	.77	49.62
54	William J. Maxwell	22.95	16.50	5.02	4.92	.66	48.73
55	Wilson W. Buchanan	23.22	16.20	3.72	5.26	.32	48.48
56	William N. King, jr	24.32	15.00	5.58	5.12	1.28	47.34
57	John F. Luby	22.77	15.18	4.86	5.06	1.04	46.35
58	Alfred N. Paxton	23.58	16.62	4.76	5.50	.68	49.86
59	Edward D. Fitzgerald	25.65	14.52	4.04	4.74	1.22	48.63
60	James C. Drake	24.57	14.28	4.86	4.90	.65	47.96
61	James Gray	22.50	16.32	4.52	4.96	1.11	47.59
62	Horatio L. Fillebrowne	23.40	14.82	4.34	5.74	.45	47.85
63	Charles H. Hill	23.76	15.48	4.44	4.16	1.30	46.54
64	Alexander R. Hasson	20.52	15.18	4.86	5.52	1.13	45.25
65	Henry M. Finley	23.04	14.46	3.18	4.72	1.30	44.10
66	Theodore G. Dewey	20.88	15.30	3.90	5.30	.76	43.92
67	Edward H. Offley	20.61	14.52	2.70	2.22	1.12	43.17
68	Nat Saunders	21.96	13.32	4.08	4.88	1.20	43.04
69	Kantaro Arima						

CADET-MIDSHIPMEN.

Deficient sections of fourth class (31 *members*).

The following Cadets, having been turned back at the semi-annual examination, have no relative position with the members of the fourth class:

‡ Arnold, J. P.
‡ Bailey, J. B.
‡ Berkely, F. L.
‡ Biddle, J. C.
‡ Bliss, Herbert.
‡ Bonfils, T. L.
§ Booth, H. D.
† Bowdon, F. W.
§ Breckinridge, R. J.
‡ Brown, J. S.
‡ Bullitt, H. H.
‡ Cockle, R. R.
‡ Cooke, P. B.
‡ Cooper, R. J.
‡ Franklin, T. B.
§ Gilmore, A. C.
‡ Gresham, W. A.
‡ Haines, H. C.
‡ Huntoon, F. A.
‡ Irving, Washington.
‡ Jackson, S. L.
‡ Jones, Richard.
‡ Kimball, E. F.
‡ Leiper, E. F.
§ Levisee, Leonidas.
§ O'Connell, James.
§ Ord, E. O. C.
‡ Porter, J. P.
‡ Rodman, Hugh.
‡ Starkloff, E. A. Von.
‡ Thompson, E. C.

CADET-ENGINEERS.

Merit-roll of the first class (3 *members*), *annual examination, June,* 1876, *and general merit-roll for two years.**

Order of general merit.	Name.	Steam-engineering.	Electricity.	Chemistry and heat.	Applied mathematics.	French.	Conduct.	Aggregate for second year.	Aggregate for first year.	General aggregate for two years.
	Maxima for this class and year	**198**	**45**	**144**	**120**	**45**	**150**	**702**	**355**	**1057**
1	William B. Dunning	132. 00	15. 00	144. 00	40. 00	30. 00	136. 65	497. 65	335. 47	833. 12
2	Henry H. Stivers	198. 00	45. 00	48. 00	120. 00	45. 00	137. 10	593. 10	153. 30	746. 40
3	Robert I. Reid	66. 00	30. 00	—48. 00	—40. 00	15. 00	138. 60	161. 60	268. 43	430. 03

* For the method used in forming this merit-roll see the Register for 1874–75.

CADET-ENGINEERS.

Merit-roll of third class (17 *members*), *annual examination, June,* 1876.

Order of annual merit.	Name.	Mathematics.	Chemistry.	History, composition, and rhetoric.	French.	Drawing.	Conduct.	Aggregate.
	Maxima	**72**	**32**	**24**	**16**	**8**		**152**
*1	**Ira N. Hollis**	72. 18	30. 08	21. 42	12. 84	7. 70	1. 29	142. 93
*2	**Franklin J. Schell**	70. 20	29. 44	21. 00	13. 00	6. 02	0. 81	139. 85
*3	**Harry W. Spangler**	70. 74	28. 00	20. 16	12. 20	6. 84	1. 00	136. 94
*4	**Goold H. Bull**	65. 52	27. 92	19. 68	12. 76	6. 92	1. 65	134. 15
5	George W. McElroy	61. 38	24. 24	17. 52	11. 00	6. 56	1. 70	119. 00
6	Frank W. Bartlett	54. 36	24. 72	19. 68	12. 60	6. 52	1. 50	116. 38
7	Robert S. Griffin	55. 62	23. 92	17. 82	12. 20	6. 30	0. 73	115. 15
8	Howard Gage	51. 48	25. 60	18. 96	11. 40	6. 34	1. 54	112. 24
9	Frederic C. Bieg	51. 84	23. 04	18. 06	12. 60	6. 38	0. 73	111. 19
10	John L. Gow	52. 74	23. 92	18. 12	10. 92	5. 98	0. 95	110. 73
11	Joseph R. Wilmer	49. 32	22. 96	19. 74	12. 40	5. 82	0. 69	109. 55
12	Mortimer E. Cooley	48. 96	24. 96	16. 56	11. 44	6. 74	1. 08	107. 58
13	Henry K. Ivers	45. 72	23. 04	18. 66	10. 84	6. 66	0. 86	104. 06
14	Charles L. Wight	47. 70	23. 68	17. 04	10. 40	6. 76	1. 56	104. 02
15	George E. Burd	46. 08	23. 20	16. 98	11. 40	6. 10	0. 84	104. 22
†	Horace G. Dungan	46. 62	22. 32	15. 84	9. 48	5. 92	1. 18	[illegible]
†	Joseph McC. Pickrell	44. 64	22. 00	16. 14	10. 88	5. 90	0. 81	[illegible]

CADET-ENGINEERS.

Merit-roll of fourth class (30 members), annual examination, June, 1876.

Order of annual merit.	Name.	Mathematics.	French.	History and composition.	Drawing.	Conduct.	Aggregate.
	Maxima	36	8	24	8		76
*1	Richard Gatewood	34.29	6.94	21.60	6.30	0.28	68.85
*2	W. M. McFarland	33.03	6.84	21.06	6.12	0.25	66.80
3	M. D. Noell	32.22	5.76	20.04	6.64	0.57	64.09
4	F. T. Bowles	30.24	6.14	20.04	6.56	0.22	62.76
5	F. M. Bennett	29.97	5.40	20.22	6.38	0.87	61.10
6	A. M. Hunt	28.17	6.10	19.20	6.62	0.38	59.71
7	J. W. Annan	27.72	6.10	19.50	6.26	0.50	59.08
8	B. C. Bryan	29.61	5.68	17.76	6.28	0.37	58.96
9	H. S. Elseffer	28.80	5.86	18.18	6.78	0.67	58.95
10	C. B. Lubbe	29.16	5.36	17.76	6.78	0.36	58.70
11	H. F. Harrison	27.36	5.54	18.90	6.20	0.36	57.64
12	H. P. Norton	27.36	5.50	17.52	7.12	0.32	57.18
13	E. H. Scribner	27.90	5.90	16.80	6.84	0.42	57.02
14	G. R. Salisbury	29.16	5.14	16.68	6.24	0.23	56.99
15	C. A. Carr	27.09	5.60	18.48	5.76	0.20	56.73
16	E. O'C. Acker	26.46	4.66	19.08	6.66	0.21	56.65
17	T. J. Hogan	25.92	5.42	18.06	7.00	0.44	55.96
18	J. U. Crygier	26.19	4.44	17.94	6.56	0.63	54.50
19	F. La M. Bartholow	25.56	5.14	17.64	5.90	0.28	53.96
20	J. H. Yarnall	24.03	6.66	17.76	5.82	0.33	53.94
21	C. G. Talcott	25.92	5.04	15.96	6.74	0.45	53.21
22	D. I. Mercier	25.74	4.70	17.46	6.06	0.83	53.13
23	Martin Bevington	25.02	5.02	17.10	6.20	0.46	52.88
24	J. H. Baker	23.94	5.42	16.92	6.12	0.30	52.10
25	F. C. Bowers	24.03	5.78	16.56	5.84	0.38	51.83
26	R. T. Isbester	23.94	5.08	17.34	6.08	1.05	51.39
27	T. F. Carter	23.13	4.70	16.02	6.22	0.16	49.91
28	William S. Smith	24.30	5.06	15.00	5.86	0.51	49.71
§	C. A. Miller	21.42	4.74	15.48	5.82	0.80	46.66
†	A. W. Temple	*a*	*a*	*a*	*a*	*a*	.....

REGULATIONS

GOVERNING

THE ADMISSION OF CANDIDATES INTO THE NAVAL ACADEMY AS CADET-MIDSHIPMEN.

NOMINATION.

I. The number of Cadet-Midshipmen allowed at the Academy is one for every Member and Delegate of the House of Representatives; one for the District of Columbia; and ten appointed annually at large.

II. The nomination of candidates for admission from the District of Columbia and at large is made by the President. The nomination of a candidate from any congressional district or Territory is made on the recommendation of the Member or Delegate from actual residents of his district or Territory.

III. Each year, as soon after the 5th of March as possible, Members and Delegates will be notified in writing of vacancies that may exist in their districts. If such Members or Delegates neglect to recommend candidates by the 1st of July in that year, the Secretary of the Navy is required by law to fill the vacancies existing in districts actually represented in Congress.

IV. The nomination of candidates is made annually between the 5th of March and the 1st of July. Candidates who are nominated in time to enable them to reach the Academy on the 21st of June will receive permission to present themselves at that time to the Superintendent of the Naval Academy, for examination as to their qualifications for admission. Those who are nominated prior to July 1, but not in time to attend the June examination, will be examined on the 12th of September following; and should any candidate fail to report, or be found physically or mentally disqualified for admission, in June, the Member or Delegate from whose district he was nominated will be notified to recommend another candidate, who shall be examined on the 12th of September following. When any of the dates assigned for examinations fall on Sunday, the examination will take place on the following Monday.

V. A sound body and healthy constitution, good mental abilities, a natural aptitude for study and habits of application, persistent effort, an obedient and orderly disposition, and correct moral principles and deportment, are so necessary to success in pursuing the course at the Academy, that persons conscious of any deficiency in these respects are earnestly recommended not to subject themselves or their friends to the mortification and disappointment consequent upon failure, by accepting nominations and attempting to enter a service for which they are not fitted.

EXAMINATION.

VI. Each candidate for appointment as Cadet-Midshipman must present to the Academic Board satisfactory testimonials of good moral character, and must certify *on honor* to his precise age, which must be over fourteen and less than eighteen years at the time of the examination. No candidate will be examined whose age does not fall within the prescribed limits.

VII. Candidates must be physically sound, well formed, and of robust constitution; they will be required to pass a satisfactory examination before a medical board com-

posed of the surgeon of the Naval Academy, and two other medical officers to be designated by the Secretary of the Navy.

VIII. Any *one* of the following conditions will be sufficient to cause the rejection of a candidate:

Feeble constitution, inherited or acquired;

Greatly-retarded development;

Permanently-impaired general health;

Decided cachexia, diathesis, or predisposition;

All chronic diseases or results of injuries that would permanently impair efficiency, viz:

Weak or disordered intellect;

Cutaneous and communicable diseases;

Unnatural curvature of spine, torticollis, or other deformity;

Permanent inefficiency of either of the extremities or articulations from any cause;

Epilepsy or other convulsions within five years:

Impaired vision, or chronic disease of the organs of vision;

Great hardness of hearing, or chronic disease of the ears;

Chronic nasal catarrh, ozæna, polypi, or great enlargement of the tonsils;

Impediment of speech to such an extent as to impair efficiency in the performance of duty;

Decided indications of liability to pulmonary disease;

Chronic cardiac affections;

Hernia or retention of testes in inguinal cavity;

Sarcocele, hydrocele, stricture, fistula, or hæmorrhoids;

Large varicose veins of lower limbs, scrotum, or cord:

Chronic ulcers.

Attention will also be paid to the stature of the candidate; and no one *manifestly* under size for his age will be received into the Academy. In case of doubt about the physical condition of the candidate, any marked deviation from the usual standard of height will add materially to the consideration for rejection. Five feet will be the minimum height for the candidate.

The board will exercise a proper discretion in the application of the above conditions to each case, rejecting no candidate who is likely to be efficient in the service, and admitting no one who is likely to prove physically inefficient. No candidate rejected by the board will be allowed a re-examination.

IX. The candidates must pass a satisfactory examination before the Academic Board in reading, writing, spelling, arithmetic, geography, and English grammar.

X. All the examinations, except in reading, will be written. Candidates who fall below the standard will receive a second and final examination in the subjects in which they fail. Deficiency in any one of the subjects at the second examination will be sufficient to insure rejection.

XI. "Candidates rejected at such examinations shall not have the privilege of another examination for admission to the same class unless recommended by the Board of Examiners."—(*Rev. Stat.*, § 1515.)

GENERAL CHARACTER OF THE QUESTIONS.

XII. ARITHMETIC.—*Notation and numeration.*—The candidate is required to express in figures any whole number, decimal, or mixed number; to write in words any given number; and to explain the Roman and Arabic systems of notation.

Denominate numbers.—The tables of money, weights, and measures in common use, including English money; addition, subtraction, multiplication, and division of denominate numbers; the relation existing between the troy and avoirdupois pound; number of cubic inches in a gallon; reduction of differences of longitude to their equivalents in time, and *vice versa*.

Fractions.—The candidate must be familiar with all the processes of common and decimal fractions, and is expected to be able to give clearly the reasons for such pro-

cesses, and to be familiar with the contracted methods of multiplication and division given in the ordinary text-books on arithmetic.

Properties of numbers.—Test of divisibility of numbers by 2, 3, 5, 8, 9, 11, 25, 125, &c.; the resolution of composite numbers into prime factors; the method of determining whether any number is prime or composite, and of finding the greatest common divisor and the least common multiple of large as well as small numbers.

Ratio and proportion.—Definitions and explanations of the nature of ratio and proportion; different methods of writing a proportion; solution of problems in simple and compound proportion.

Percentage, interest, and discount.—Examples usually given under these heads in arithmetics.

Mensuration.—The measurement of rectangular surfaces and volumes.

Evolution.—The extraction of square and cube roots.

Analysis.—Miscellaneous problems usually classed under this head, similar to those found in school arithmetics. It is essential that the candidate shall be thoroughly proficient in all branches of arithmetic; unusual excellence in this will be allowed to count in his favor in case of a slight deficiency in other subjects.

Should persons intending to present themselves as candidates acquire a knowledge of algebra, it will be found to be of material assistance in the course of study pursued at the Academy, although not required for admission.

When practicable, should the candidate so prefer, algebraic solutions of problems may be substituted for arithmetical solutions.

GEOGRAPHY.—Candidates will be questioned on the grand divisions of the land and water; the character of coast-lines; the direction and position of mountain-chains and the locality of important peaks; the position and course of rivers, their tributaries, and the bodies of water into which they empty; the position of important seas, bays, gulfs, and arms of the sea; the political divisions of the land, their position, boundaries, and capital cities; the position and direction of great peninsulas, and the situation of important and prominent capes; straits, sounds, channels, and the most important canals; great lakes and inland seas; position and political connection of important islands and colonial possessions; locality of cities of historical, political, or commercial importance (attention is specially called to the rivers and bodies of water on which cities are situated); the course of a vessel in making a voyage between well-known sea-ports.

GRAMMAR.—Candidates will be examined in the whole of English grammar as treated in the common-school text-books, embracing the following subjects: The divisions of letters, and the use of capitals; the parts of speech; the classification of *nouns*, and the distinctions of person, gender, and number; under *number*, the rules for the formation of the plural, nouns irregular and defective in number, the plural of proper names; under *case*, the different uses of the three cases, the rules for inflection, the changes in ending to denote case; the difference between the definite and indefinite *article*, and the use of *a* or *an*; the classification of *adjectives*; the explanation of the different degrees of comparison; the rules for *comparing adjectives*; irregular and defective comparison; numerals and their classification; the double classification of *pronouns*, first, into substantives and adjectives, secondly, into personals, relatives, &c.; peculiarities in the use of personal pronouns, as, the difference between *my* and *mine*, between *thou* and *you*, and the various uses of *it*; compound personal pronouns; the double office of relatives, and the different classes of objects to which each of them is applied; compound relative pronouns; interrogative pronouns; adjective pronouns, or pronominal adjectives, and their classification; the classification and conjugation of *verbs*; the relations between transitive and intransitive verbs; the principal parts of regular, irregular, and defective verbs; the uses and inflexion of auxiliaries; the essential peculiarities in the use of voice, mood, tense, number, and person; tense-endings and personal endings; impersonal verbs; the classification, formation, and comparison of *adverbs*; conjunctive adverbs; the use of *prepositions*, *interjections*, and *conjunctions*, with the classification of the latter.

The rules for the construction and arrangement of words and sentences, given unde syntax.

Parsing, according to the following model:

Noun: Class, gender, number, person, case.

Article: Definite or indefinite; qualified noun.

Adjective: Class, compared or not compared; comparison, if admitting it; degree of comparison; qualified noun.

Personal pronoun: Person, gender, number, case.

Relative pronoun: Person, gender, number, case, antecedent.

Interrogative pronoun: Gender, number, case.

Adjective pronoun (or pronominal adjective): Class; qualified word.

Verb: Class, form, principal parts, tense, mood, voice, person, number, subject

Adverb: Class; derivation and comparison, if derived and compared; qualified word.

Preposition: Words between which the relation is shown by the preposition.

Interjection: The kind of emotion expressed.

Conjunction: Class; words or sentences connected.

The construction of the word will be required in all cases.

READING.—Candidates will be examined in reading aloud English prose, in a standard work; for example, Bancroft's History of the United States.

WRITING AND SPELLING.—Candidates will be required to write a short original letter, and an exercise in dictation, and to spell twenty-four words in common use.

An exercise containing eight or more mistakes in spelling will not be considered satisfactory, and will be sufficient of itself to cause the rejection of the candidate.

ADMISSION.

XIII. Candidates who pass the physical and mental examinations will receive appointments as Cadet-Midshipmen, and become inmates of the Academy. Each cadet will be required to sign articles by which he binds himself to serve in the United States Navy eight years (including his time of probation at the Naval Academy), unless sooner discharged. The pay of a Cadet-Midshipman is $500 a year, commencing at the date of his admission.

XIV. Cadets immediately after their admission will supply themselves with the following articles, viz:

One parade-suit	$37 72	One hair-mattress	$8 45
One undress-suit	15 79	One straw-mattress	1 35
One working-suit	2 98	One hair-pillow	1 22
One overcoat	22 80	One pair blankets	4 03
One rubber-coat	5 35	Two bed-spreads	2 36
One parade-cap	3 95	Six sheets	4 71
One undress-cap	1 65	Four pillow-cases	1 24
* Two pairs high shoes	12 50	* One tooth-brush	25
One pair gymnastic slippers	95	* One hair-brush	80
* Eight white shirts	14 85	* One whisk	27
* Two night-shirts	2 60	* One coarse comb	28
* Four under-shirts	2 52	* One fine comb	30
Twelve linen collars	1 68	One mug	13
* Eight pairs socks	2 00	* One cake soap	10
* Four pairs drawers	2 64	One soap-dish	13
* Six handkerchiefs	1 62	One requisition-book	30
* Eight towels	2 00	One laundry-book	30
Two pairs drill-gloves	1 32	One pass-book	30
Two pairs Lisle-thread gloves	58	One stencil and ink	23
* One pair suspenders	42	* One thread and needle case	53
One neck-tie	42	One rug	1 71
Two clothes-bags	62	One wash-basin and pitcher	1 30

Room-mates will procure for their common use—

One looking-glass (half-cost)	$0 66	One broom (half-cost)	$0 18
One water-pail (half-cost)	49	One table-cover (half-cost)	63
One slop-bucket (half-cost)	49		
Total			169 70

The articles marked *, not being required to conform to a standard pattern, may be brought by the cadet from home; but all other articles must conform to the regulations, and must therefore be supplied by the storekeeper.

X. Each Cadet-Midshipman must, on admission, deposit with the paymaster the sum of $50, for which he will be credited on the books of that officer, to be expended, by direction of the Superintendent, in the purchase of text-books, and other authorized articles besides those enumerated in the preceding article.

All the deposits for clothing and the entrance-deposit of $50 must be made before a candidate can be received into the Academy.

SUMMARY OF EXPENSES.

Deposit for clothing	$169 70
Deposit for books, &c	50 00
Total deposit required	219 70

The value of clothing brought from home is to be deducted from this amount.

Each Cadet-Midshipman, *one month after admission*, will be credited with the amount of his actual expenses in traveling from his home to the Academy.

XV. A Cadet-Midshipman who voluntarily resigns his appointment within a year of the time of his admission to the Academy will be required to refund the amount paid him for traveling-expenses.

GEO. M. ROBESON,
Secretary of the Navy.

EXAMINATION OF CANDIDATES FOR ADMISSION AS CADET-MIDSHIPMEN, JUNE AND SEPTEMBER, 1876.

ARITHMETIC.

SEPTEMBER, 1876.—*Time allowed, five hours.*

Two questions may be omitted.

1. Express 6749 *thousandths* and 397 *millionths* as decimals, and find the quotient of the first by the second.

Reduce $\left(\frac{3}{25} \text{ of } 2.45 - \frac{1}{100} \text{ of } .02\right) \div 1000$ to a decimal

Which is the greatest and which the least of the expressions, $\frac{2}{3} + \frac{3}{4}$, 1.41421, and $\frac{1}{2} + \frac{1}{5} + \frac{5}{7}$?

What decimal part is .7409375 of 237100?

2. By what fraction must $\frac{1\frac{1}{4}}{1\frac{1}{12}}$ of $\frac{2}{3} + \frac{2\frac{1}{2} - 1\frac{5}{6}}{\frac{1}{4} + 1\frac{5}{6}} - \frac{3\frac{1}{3}}{7\frac{3}{5}}$ be *divided*, that the quotient may be $\frac{3}{5}$?

The factors of a certain number are $1\frac{7}{12}$, $2\frac{5}{8}$, $1\frac{1}{14}$, and $5\frac{1}{4}$. What is $\frac{3}{5}$ of $\frac{5}{21}$ of $\frac{3}{8}$ of this number?

The sum of two fractions is $1\frac{13}{16}$, and their difference is $\frac{7}{16}$. Find the fractions.

3. Reduce $\frac{5}{9}$ of 16*s.* 4½*d.* to the decimal of £1.

One kilometre = 1000 metres = $\frac{5}{8}$ of a mile. Reduce 17 miles 6 furlongs 82 yards 1½ feet to metres.

Find the value of 27 yards 2 feet 9 inches of gold lace, $\frac{2}{3}$ of an inch wide, if 17 yards 1 foot 11 inches of lace, 1 inch wide, cost $25.40.

4. One-third of *A's* money is equal to two-fifths of *B's*, and *A* has $17.50 more than *B*; how much money has each?

A and *B* run a race, their rates of running being as 17 to 18: *A* runs 2⅔ miles in 16 minutes 48 seconds, and *B* runs the whole distance in 34 minutes. What was the distance run?

5. What is the present worth of $5747, due 9 months hence, interest at 3½ per cent.?

A vessel is worth $96084; for what sum must her owner insure her, so that, if she is lost, he may receive both the value of the vessel and the sum paid for insuring her, the rate of insurance being 1⅓ per cent.?

6. Extract the square root of 900780169, and find the value of $\frac{\sqrt{2} - 1}{\sqrt{2} + 1}$ to four decimal places.

7. A contractor undertook to complete a piece of work in 84 days, and engaged 30 men to do it; after 40 days, he put on 20 more men, and then finished the work 2 days too soon. How many days behindhand would he have been if he had not engaged the additional men?

8. The walls of a room are to be papered; the room is 23 feet 8 inches long, 15 feet 10 inches wide, and 11 feet 9 inches high; there are two windows, each 9 feet 6 inches high and 5 feet wide: a fire-place, 4 feet 6 inches high and 6 feet wide; and a door, 7 feet 6 inches high, 3 feet 6 inches wide. Find the cost of the paper required, at $4.08 per roll of 12 yards, the paper being 26 inches wide.

9. Two trains, 92 feet and 84 feet in length respectively, are moving on parallel rails in opposite directions, and are observed to pass each other in one second and a half;

but when they are moving in the same direction, the velocities being the same as before, the faster train is observed to pass the other in six seconds. Find the rate in miles per hour at which each train travels.

10. On a piece of work 3 men and 5 boys are employed, who do $\frac{1}{2}$ of it in 5 days; after this, 1 more man and 5 more boys are put on, and the work is completed in 3 days more. How long would it take a man to do the whole work alone, and how long would it take a boy?

ENGLISH BRANCHES.

JUNE 23, 1876.—*Time allowed, three hours.*

GRAMMAR.

1. "To live with them is far less sweet than to remember thee." Analyze.
2. Name the three cases, and explain the different uses of each.
3. What part of speech is *that* in each of the following sentences?

I know *that* you are right.
The good *that* I would, I do not.
Do you dare tell me *that?*

4. Give the possessive plural of *box, enemy, journey, wreath.*
Give the past participle of *lay, die, thrust.*
5. "But *how* can he expect *that others should*
Build for him, sow for him, and at his call
Love him, *who* for himself will take *no heed at all?*
Parse the words in Italics.

GEOGRAPHY.

1. State where, and on what water, the following cities are situated: 1. Glasgow; 2. Trieste; 3. Calcutta; 4. Petersburg.

2. Describe the following rivers, telling where they rise, in what direction they flow, into what water they empty: 1. Mohawk; 2. Congo; 3. Brahmaputra; 4. Humber.

3. Where is Cape Wrath? Cape Matapan? Cape Gallinas? Cape Palmas?

4. Fix the position and direction of the following: 1. Grampian Hills; 2. Carpathian Mountains; 3. Green Mountains.

5. Make a coasting voyage between Portland, Me., and New Orleans, stopping at six seaports. State in order the bodies of water passed through, the position of the cities visited, and the names of the States passed.

SPELLING.

Scientific.	Disrespect.	Incessant.	Campaign.
Supremacy.	Caprice.	Proceed.	Subterranean.
Economy.	Galley.	Supersede.	Intrepid.
Stratagem.	Grenadier.	Quarrel.	Phraseology.
Clerical.	Forage.	Artificer.	Quarantine.
Acquiesce.	Equivalent.	Exhaustion.	Permanent.

RE-EXAMINATIONS.

ARITHMETIC.

SEPTEMBER, 1876.—*Time allowed, five hours.*

Two questions may be omitted.

1. Simplify each of the expressions: $\frac{.0075 \times 2.1}{.0175}$, $\frac{4.255 \times .0064}{.00032}$, $\frac{5\frac{3}{8}}{7\frac{1}{2}}$ of $\frac{21.25}{.046875}$, and $\frac{31.31 + .0298}{.1 - .092574}$.

Divide 10.01 by .00091 and .00091 by 10.01, and multiply the two quotients together.

2. How many times is the difference between the product and sum of $7\frac{1}{2}$ and $4\frac{2}{3}$ contained in $\frac{1}{5}$ of $\frac{2}{3}$ of $\frac{25}{28}$ of $\frac{7}{10} \div \frac{1}{8}$ of $\frac{8}{3}$ of $7\frac{1}{5} + 16\frac{1}{60}$?

Reduce to its simplest form—

$$\frac{5\frac{5}{8} + 5\frac{1}{6}}{5\frac{5}{8} - 5\frac{1}{6}} \div \frac{\left(4\frac{2}{3} - \frac{55}{12}\right) \text{ of } \frac{24}{33}}{4\frac{2}{3} + \frac{55}{12} \text{ of } \frac{24}{33}}$$

Given that the sum of the divisor and quotient is 33600, also that the quotient is 15 times the divisor, and the remainder is $\frac{1}{15}$ of the divisor; find the dividend.

3. Reduce $\frac{3\frac{1}{9}}{1\frac{1}{13}}$ of $\left\{ \frac{19}{20} \text{ of } £1 - \frac{7}{48} \text{ of } 1s. \right\}$ to the fraction of £9 16*s.* 1*d.*

How many gallons of water will it take to cover an acre of ground to the depth of one inch?

4. *A* can do in 2 days as much work as *B* in 3 days, and *B* in 5 days as much work as *C* in 4 days; what time will *C* require to finish a piece of work which *A* can do in 9 days?

Divide $100 between two persons so that one may have $\frac{7}{9}$ as much as the other.

5. A man bought a horse for $365, giving his note due in 30 days; he sold the horse at once, taking in payment a note for $435, due in 4 months; what was his gain per cent.? (Interest at 6 per cent. per annum.)

In what time will the interest on £57 1*s.* 8*d.* amount to £2 11*s.* $4\frac{1}{2}$*d.* at $7\frac{1}{2}$ per cent. per annum?

6. Which is the greater, the square root of 281, or the cube root of 4711?

7. A contractor engages what he considers a sufficient number of men to do a piece of work in 84 days; but he ascertains that 3 of his men do respectively $\frac{1}{6}$, $\frac{1}{7}$, and $\frac{1}{9}$ less than an average day's work, and two others $\frac{1}{8}$ and $\frac{1}{10}$ more; in order to complete the work in the given time, he procures the help of 17 additional men for the 84th day. How much less or more than an average day's work on the part of these 17 men is required?

8. The floor of a hall is 260 feet long and 93 feet wide; find the cost of covering it with carpet and oil-cloth; the oil-cloth to be laid along the sides and ends a yard wide, and the carpet to extend 6 inches over the oil-cloth; carpet, $2.09 a yard, 38 inches wide; oil-cloth, 90 cents a square yard.

9. A man can walk from *A* to *B* in 1 hour less than a second man, and, when they start from opposite ends of the distance and walk in contrary directions, they meet at a point which is twice as far from *A* as it is from *B*; if the first man walks 5 miles per hour, what is the distance between *A* and *B*?

10. A train leaves *B* at 9 a. m. and runs to *C* at the rate of 15 miles an hour; and another train leaves *A* at noon, and, running through *B* to *C* at 25 miles an hour, reaches *C* half an hour later than the train from *B*. Find the distance from *A* to *C*, the distance from *A* to *B* being 15 miles.

ENGLISH BRANCHES.

JUNE 24, 1876.—*Time allowed, three hours.*

GRAMMAR.

1. Give the possessive, singular and plural, of *ally, alley, spray, grief, leaf, loss.*

2. Explain the difference between the active and the passive voice. Explain transitive and intransitive verbs, and show how the distinction of voice applies in the two classes.

3. Name the relative pronouns, and state to what class of objects each of them is applied.

4. Give the principal parts of *fly, flee, weave, fight, drown, burst.*

5. Analyze the following sentence, and name the parts of speech:

"That man has been from time immemorial a right-handed animal, is beyond dispute."

GEOGRAPHY.

1. Fix the position of the following cities, and tell which of them are capitals of States: 1. Galveston; 2. Bangkok; 3. Columbus; 4. Hamburg; 5. Melbourne.

2. State what bodies of water are connected, and what bodies of land separated, by the following: 1. Torres Strait; 2. Strait of Sunda; 3. Niagara River; 4. St. George's Channel; 5. Strait of Ormuz.

3. Bound Nevada. Name the Territories of the United States.

4. Give the source, direction, and mouth of the Wabash River; Gila River; Douro River; Oder River.

5. Make a voyage from Matanzas to Constantinople.

SPELLING.

Eligible.	Principally.	Talisman.	Allegiance.
Colleague.	Privilege.	Scrutiny.	Skirmisher.
Business.	Reckoned.	Malice.	Feigning.
Efficient.	Frivolous.	Countenance.	Tenable.
Apostle.	Malediction.	Integer.	Treachery.
Government.	Colloquy.	Foreigner.	Cement.

REGULATIONS

FOR THE

APPOINTMENT OF CADET-ENGINEERS IN THE UNITED STATES NAVY.

I. In pursuance of law, applications will be received by the Navy Department for the appointment of Cadet-Engineers.

II. The application is to be addressed to the Secretary of the Navy, and can be made by the candidate or by any person for him, and his name will be placed on the register. The registry of a name, however, gives no assurance of an appointment, and no preference will be given in the selection to priority of application.

III. The number of appointments which can be made is limited by law to twenty-five each year. The candidate must not be less than sixteen nor more than twenty years of age; he will be required to certify *on honor* to his precise age, to the Academic Board, previous to his examination, and no one will be examined who is over or under the prescribed age. His application must be accompanied by satisfactory evidence of moral character and health, with information regarding date of birth and educational advantages hitherto enjoyed. Candidates who receive permission will present themselves to the Superintendent of the Naval Academy on the 5th of September for examination as to their qualifications for admission.

IV. The course of study will comprise four academic years, with two additional years at sea. All cadets who finally graduate will be commissioned Assistant Engineers in the Navy as vacancies occur. The pay of a Cadet-Engineer is the same as that of a Cadet-Midshipman, $500 per annum, and at sea the same as Midshipmen.

V. The academic examination previous to appointment will be competitive, and will be on the following subjects, namely: Arithmetic; algebra, through equations of the first degree; plane geometry; rudimentary natural philosophy; reading; writing; spelling; English grammar; English composition; and geography. The candidate will also be required to exhibit a fair degree of proficiency in pencil-sketching, and to produce satisfactory evidence of mechanical aptitude. Candidates who possess the greatest skill and experience in the practical knowledge of machinery, *other qualifications being equal*, shall have precedence for admission.

The other requisites and conditions are the same as those for the admission of Cadet-Midshipmen.

COMPETITIVE EXAMINATION OF CANDIDATES FOR APPOINTMENT AS CADET-ENGINEERS, SEPTEMBER, 1876.

ARITHMETIC.

Time allowed, two and a half hours.

Algebraic solutions not admitted.

1. Find the value to six places of decimals of the series,

$$\frac{2}{5}+\frac{4}{5.10}+\frac{8}{5.10.15}+\frac{16}{5.10.15.20}+\text{ \&c.}$$

Express $.144\dot{2}30769$ as a common fraction, and reduce to a decimal

$$\frac{.0759}{2\frac{5}{7}-\frac{23}{24}}\div\frac{3\frac{4}{15}-\frac{19}{20}}{14.75}.$$

2. Simplify the expression:

$$\frac{\frac{3}{5}\text{ of }(\frac{6}{7}-\frac{3}{4})}{\frac{7}{9}\text{ of }(\frac{3}{4}-\frac{5}{7})}\text{ of }\left\{\begin{matrix}\frac{8}{15}-\frac{6}{13}\\ \frac{5}{13}-\frac{3}{14}\end{matrix}\right\}-\frac{9\frac{1}{2}+3\frac{1}{9}}{5\frac{1}{14}\text{ of }7\frac{1}{9}}+\frac{7\frac{5}{8}-4\frac{2}{8}}{2\frac{31}{23}-\frac{1}{21}}$$

3. Find the value of the expression $\dfrac{\sqrt{23}-4}{\sqrt{23}+4}+\dfrac{10-\sqrt{23}}{10+\sqrt{23}}$ to two decimal places

Express the cube root of .00448 as a decimal of the cube root of .0875.

4. A grocer has a pair of false scales, such that a parcel which weighs 49 lbs. in one scale weighs 64 lbs. in the other. If he uses these scales in buying and selling in the way most advantageous to himself, what per cent. does he make on an article which he buys at 15 cents per lb. and sells at 18 cents? What does he make on the same article when he uses the false scales for selling only?

5. *A* sold a vessel worth $40000 to *B* at a certain loss per cent. *B* sold her to *C* at the same losing rate, and *C* sold her for $36750, by which he made 20 per cent. on his purchase. What per cent. did *A* and *B* each lose?

ALGEBRA.

Time allowed, three hours.

1. Solve the equations:

$$\frac{3x+3}{16}+\frac{7x-4}{15}-\frac{7x+1}{20}=2;\quad a+x+\sqrt{a^2+bx+x^2}=b;$$

$$\text{and }\frac{17}{6x-17}-\frac{10}{3x-10}=\frac{1}{1-2x}.$$

2. Solve the equations:

$$\left.\begin{matrix}101x-24y=63\\ 103x-28y=29\end{matrix}\right\};\quad \left.\begin{matrix}x+y+z=36\\ 5x-2y=80\\ 7x-9z=86\end{matrix}\right\};\text{ and }\left.\begin{matrix}ax+by=c\\ mx-ny=d\end{matrix}\right\}.$$

3. Find the greatest common divisor of x^4-41x^2+16 and $x^4-7x^3+28x-16$.

Reduce the fraction $\dfrac{56x^3-28x^2-42x+14}{42x^2-28x-14}$ to its lowest terms.

Find the least common multiple of $a^4 - 10a^2 + 9$, $a^4 + 10a^3 + 20a^2 - 10a - 21$, and $a^4 + 4a^3 - 22a^2 - 4a + 21$.

4. A and B run a race of a yards; first A gives B a start of b yards and beats him by c seconds; then A gives B a start of d seconds and is beaten by e yards; find the time in which A and B can each run a mile. Verify the result, making the following substitutions: $a, 1760$; $b, 44$; $c, 51$; $d, 75$; $e, 88$.

5. A person starts to walk at a uniform speed, without stopping, from A to B and back, at the same time that another starts to walk at a uniform speed, without stopping, from B to A and back; they meet a mile and a half from B, and again, an hour after, a mile from A; find the rates of walking and the distance between A and B.

GEOMETRY.

Time allowed, two hours.

1. Prove that, if through a fixed point within a circle any chord be drawn, the product of its two segments will have the same value, whatever be the direction of the chord. What is the *least* chord that can be so drawn? the *greatest?*

2. What is meant by a *mean proportional?* Prove that if through a fixed point without a circle, a tangent to the circle be drawn, and also any secant, the tangent is a mean proportional between the whole secant and its external segment.

3. Prove that the square described upon the hypothenuse of a right triangle is equivalent to the sum of the squares described upon the other two sides.

4. Prove that the side of a regular hexagon is equal to the radius of the circumscribed circle. Denoting the radius of the circle by a, find an expression for the length of a side of the inscribed equilateral triangle, and also for the area of the triangle.

5. If, at any point D in the side $A C$ of the triangle $A B C$, a straight line $D E$ be drawn making an angle $A D E$ equal to the angle $A B C$, and meeting $A B$ in E, prove that if $D B$ and $E C$ be drawn, the angle $A D B$ is equal to the angle $A E C$.

NATURAL PHILOSOPHY.

Time allowed, three hours.

1. How are forces measured? What is the *moment* of a force? Define *weight*, *mass*, and *specific gravity*.

At what part of the earth's surface is the weight of a body, as determined by a spring-balance, the greatest, and why?

2. Define *centre of gravity;* also stable, unstable, and neutral equilibrium.

The distance of the centre of gravity of a cone from its base is equal to one-fourth the altitude.

Find the position of the centre of gravity of a body formed of two cones (altitudes a and b) having a common base, the vertices being on opposite sides of the base.

3. Show that a board cut in the form of a rhombus is always in stable equilibrium when resting on its edge on a horizontal plane.

A conical sugar-loaf whose height is twice the diameter of its base stands on a table sufficiently rough to prevent it from sliding; if the table be tilted until the sugar-loaf is on the point of toppling over, find the inclination of the table to the horizon.

4. The *wheel and axle* being in equilibrium, find the relation between the power and the weight.

Two wheels are connected by a rough endless rope: the diameter of the larger wheel being four times that of the smaller, find the ratio of the axles in order that equal weights suspended from cords wound round the axles in contrary directions may produce equilibrium.

5. What kind of velocity is produced by the action of a constant force?

Give the three laws of motion.

Find the space described by a falling body during the third second of its motion.

6. How is the pressure of a fluid upon any point of the containing vessel determined?

A pipe carries the rain-water from the top of a house to a tank, from which the surplus water escapes by means of a valve in the top; it is found that a weight of 24 lbs. placed on the valve causes the water to rise in the pipe to the height of 20 ft.; find the area of the valve.

7. Sketch a common hydrometer.

If the volume between two successive graduations on the stem of a hydrometer be one thousandth part of its whole bulk, and it float in distilled water with 20 divisions, and in sea-water with 46 divisions above the surface, find the specific gravity of sea-water.

The cavity in a conical rifle-bullet is filled with a plug of pine wood. If the bullet be held in the hand beneath the surface of water, and the plug be then removed, will the apparent weight of the bullet be increased or diminished?

8. How may the height of a mountain be ascertained roughly by means of a thermometer?

If the difference of readings of a thermometer which is graduated according to both Fahrenheit's and the centigrade scale be 40, find the temperature by each scale.

ENGLISH BRANCHES.

Time allowed, three hours.

SPELLING.

Judicious.	Effective.	Conscience.	Artillery.
Conception.	Manifest.	Apprehension.	Military.
Phrase.	Specific.	Acuteness.	Sluggish.
Atmospheric.	Typical.	Process.	Resources.
Relevant.	Precise.	Edifice.	Catastrophe.
Anomaly.	Nursery.	Analysis.	Cavil.

GEOGRAPHY.

1. Where is Cheyenne? Cayenne? Sydney? Stettin? Sheffield? Tell which, if any, are capitals of States.

2. Give the position and direction of the Pyrenees Mountains; Ural Mountains; Altai Mountains; Alleghany Mountains. Tell what States are bounded by each of these ranges.

3. Name in order the States of South America that border on the sea-coast, and mention three seaports in these States, giving the position of each.

4. Give the source, direction, and mouth of the Roanoke River; St. Clair River; and of any two rivers of France.

5. Make a voyage from Buenos Ayres to Bombay via the Suez Canal, and stop at three seaports on the way. Name in order the waters passed through, and fix the position of the ports.

ENGLISH GRAMMAR.

1. Give the possessive singular and objective plural of *canopy, knife, chimney, calico.*

2. State the voice, mood, tense, person, number, and principal parts of each of the following verbs:

1. You *should be overthrown.*
2. I *am sleeping.*
3. One on earth in silence *wrought.*
4. A shell *burst* near them.

3. What is a demonstrative pronoun? an impersonal verb? a conjunctive adverb? What is the object of the inflexion of nouns?

4. Analyze the following sentence:

"But you, who know me better, know that I am something more than the name would imply."

5. Parse the words in italics:

"*Some have gone* on long *travel*, into distant lands, *unarmed, valiantly bearing* the sacred symbol into heathen countries."

COURSE OF INSTRUCTION.

DEPARTMENT OF SEAMANSHIP.

SEAMANSHIP.*—Description of all kinds of rope, and its practical manipulation for all purposes on shipboard; measuring for and fitting standing and running rigging; masting, sparring, and rigging ship; getting on board and stowing a vessel's outfit; organizing a ship's company; fittings of boats; management of boats under all circumstances; evolutions of vessels at sea and in harbor; repair of spars and rigging in cases of accident; duties of officers at sea and in port; rules of the road; wind and weather.

Text-book.—Luce's Seamanship, with lectures, and illustrations from models.

NAVAL CONSTRUCTION.

Text-books.—Thearle's Naval Architecture and Wilson's Ship-Building, with lectures illustrated by models and drawings.

NAVAL TACTICS.*—Organization, formations, and manœuvering of a fleet, under steam or sail.

Text-books.—Manual of Naval Tactics (Ward); Steam Fleet Tactics (Parker); United States Naval Signal-Book; Manual of Signals (Myer).

PRACTICAL EXERCISES, consisting of—

SEAMANSHIP-DRILLS.*—Exercises on shipboard with sails and spars.

NAVAL TACTICS.*—Exercises in boats under oars and under sails.

SIGNALS.—Exercises in the use of signals according to Myer's Army Signal Code.

The instruction in boxing, gymnastics, swimming, and dancing is in charge of this department.

DEPARTMENT OF ORDNANCE AND GUNNERY.

PRACTICE AND THEORY OF GUNNERY.*—*Practical naval gunnery*, as laid down in the Ordnance and Gunnery Instructions for the United States Navy.

Preparation of gun-iron from crude ore, including the description and use of furnaces. Manufacture of wrought iron, steel, and bronze. Fabrication of guns of all descriptions. Manufacture of gunpowder and fuses, and of all kinds of projectiles and fireworks.

Theory of gunnery.—Motion of projectiles *in vacuo* and in the atmosphere; initial, remaining, and final velocities, and the methods of determining their values; the effects of variations of charge, windage, and weight of projectiles; deviation of projectiles; the several systems of pointing; tangent-sights and determination of their values; penetration and shock of projectiles; and recoil of guns.

Text-books.—Cooke's Naval Ordnance and Gunnery; Ordnance Instructions, United States Navy; Gunnery Instructions, United States Navy.

INFANTRY TACTICS.*—Organization and formation of squad, company, and battalion; school of the soldier; company and battalion drill, including instructions for skirmishers and the bayonet exercise.

Text-books.—United States Infantry Tactics; Wingate's Rifle Practice.

PRACTICAL EXERCISES, consisting of—

INFANTRY-DRILL.

FIELD-ARTILLERY AND BOAT-HOWITZER EXERCISE.

GREAT GUNS.—Exercises and target-practice on board the United States ship Santee.

MORTAR-PRACTICE.

FENCING.—Exercise with small-swords and broad-swords.

* Cadet-Midshipmen only.

DEPARTMENT OF MATHEMATICS.

ALGEBRA.—Fundamental operations; reduction and conversion of fractional and surd quantities; involution and evolution; reduction and solution of equations of the first and second degrees; the summation of series; the nature, construction, and use of logarithms; the theory of equations.

GEOMETRY.—Plane and solid geometry; the mensuration of surfaces and volumes; the application of algebra to geometry.

TRIGONOMETRY.—Analytical investigation of trigonometric formulas, and their application to all the cases of plane and spherical trigonometry; the construction and use of trigonometric tables; the solution of trigonometric equations; trigonometric series.

ANALYTICAL GEOMETRY.—Equations of the right line, plane, and conic sections; discussion of the general equation of the second degree involving two or three variables; determination of loci; principal problems relating to the cylinder, cone, sphere, and spheroids.

DESCRIPTIVE GEOMETRY.—The graphic illustration and solution of problems in solid geometry, and the application of the method, particularly to the projections of the sphere and the construction of maps.

Text-books.—Ray's Higher Algebra; Chauvenet's Geometry; Chauvenet's Trigonometry; Church's Descriptive Geometry; Todhunter's Conic Sections; Bowditch's Useful Tables.

ELECTIVE COURSES.

In addition to the above, Cadets of the third and fourth classes who display marked ability in mathematics are permitted to take an advanced course. The following are the elective courses for 1876–77:

Fourth class.—Algebra, the theory of equations, and curve-tracing.

Third class.—The elements of the differential and integral calculus, with applications to trigonometry and geometry of two dimensions.

Text-books.—Todhunter's Algebra for Colleges and Schools; Todhunter's Theory of Equations; Rice and Johnson's Elements of the Differential and Integral Calculus.

DEPARTMENT OF STEAM-ENGINEERING.

MARINE ENGINES.—General theory of the steam-engine; classification and details of marine steam-engines, and of instruments and apparatus used in connection with them; the principles followed to insure strength in construction; the computation of the power and its cost; the duties of the engine-room watch, and of the engineer division.

FABRICATION OF MACHINERY.*—The qualities and strength of materials, and the processes of manufacture.

DESIGNING OF MACHINERY.*—The designing and construction of engines and other machinery, and the motions employed in valve-gearing.

MECHANICAL DRAWING.*—The nomenclature of design and construction; general and conventional practices of the art; the execution of plans, elevations, and sections.

PRACTICAL EXERCISES.—The management of marine steam-apparatus; [the use of tools and machines; hand-work of the machine-shop, pattern-shop, smithery, boiler-shop, and foundry.]*

Text-books.—King's Practical Notes on the Steam-Engine; Bourne's Hand-Book of the Steam-Engine; Warren's Elements of Mechanical Drawing; Willis's Principles of Mechanism; Rankine's Steam-Engine and other Prime Movers; Zeuner's Valve-Motion.

*Cadet Engineers only.

DEPARTMENT OF ASTRONOMY, NAVIGATION, AND SURVEYING.

ASTRONOMY.—Descriptive and practical astronomy, including the use of instruments, especially those used for determining terrestrial latitudes and longitudes.

Text-book.—C. J. White's Astronomy.

NAVIGATION.*—Theory and practice of navigation, the latter including instruction in the duties of the navigator, the use of navigating-instruments, and their construction, with the solution of problems and the use of tables.

Text-books.—Coffin's Navigation; Merrifield's Deviation of the Compass.

SURVEYING.*—The form of the earth, with special reference to the construction of charts; explanation of geodetical surveys; the solution of problems in nautical surveying; and practical work in surveying and constructing charts.

Text-book.—Jeffers's Marine Surveying.

DEPARTMENT OF PHYSICS AND CHEMISTRY.

ACOUSTICS.—Theory of waves; the production and propagation of sound; the numerical evaluation of sound; modes of vibration; communication of vibrations; analysis of vibrations.

OPTICS.—The propagation, reflection, and refraction of light; lenses, vision, and optical instruments; spectrum-analysis; color; the undulatory theory of light; polarization and double refraction.

ELECTRICITY AND MAGNETISM.—Magnetism; statical electricity; Voltaic electricity; electro-magnetism; electrical measurements; applications of electricity; thermo-electricity.

CHEMISTRY.—General chemistry.

METEOROLOGY AND CLIMATOLOGY.

EXPERIMENTAL LECTURES IN PHYSICS AND CHEMISTRY.

HEAT.—Theories of heat; sources of heat; conduction, radiation, and convection; specific heat; sensible and insensible caloric; effects of heat; instruments used for the measurement of heat; thermo-dynamics.

Text-books.—Stewart's Elementary Physics; Eliot and Storer's Chemical Analysis; Jenkin's Magnetism and Electricity; Stewart's Elementary Treatise on Heat; Miller's Inorganic Chemistry.

Reference-books.—Ganot's Physics; Maxwell's Theory of Heat.

DEPARTMENT OF MECHANICS AND APPLIED MATHEMATICS.

THE DIFFERENTIAL AND INTEGRAL CALCULUS.—The principles of the differential calculus, including Taylor's theorem, applications to problems of maxima and minima and the tracing of curves; the methods of integration, and the application of the integral calculus to areas, surfaces, and volumes, and to the finding of centres of gravity and moments of inertia, and to the simpler cases of differential equations.

MECHANICS.—*Statics*, including the theory of friction, adhesion, and stiffness of cordage. *Dynamics*, including the motion of projectiles in a non-resisting medium and in air; motions of translation and of rotation of bodies about an axis; falling bodies; central forces; the simple and the compound pendulum; the laws of planetary motion; work, and conservation of energy.

HYDROSTATICS.—Mechanical properties of fluids; the laws of equilibrium and pressure; the flotation of bodies; the stability and oscillations of floating bodies; specific gravity; the motion of liquids. *Æriform fluids.*—Laws of pressure; weight and pressure of the atmosphere; density and temperature; the barometer, the siphon, and the pump.

THE STRENGTH AND RESISTANCE OF MATERIALS.†—Strength and flexure of beams; beams of uniform resistance; results obtained by experimentors.

* Cadet-Midshipmen only. † Cadet-Engineers only.

Text-books.—Rice and Johnson's Elements of the Differential and Integral Calculus; Todhunter's Mechanics for Beginners; Smith's Hydrostatics; and Wood's Treatise on the Resistance of Materials.

ELECTIVE COURSE.

Cadets who have completed the elective course in mathematics are permitted to take an advanced course in integral calculus and analytical mechanics.

Text-book.—Williamson's Integral Calculus.

DEPARTMENT OF ENGLISH STUDIES, HISTORY, AND LAW.

LAW.—Constitution of the United States.

International law:—origin and growth of the science; rights and duties of nations in peace and war; rights of interference, of jurisdiction over the sea, of commerce, of passage over land and navigable rivers; extradition; duties of ministers, consuls, and naval commanders; confiscation of an enemy's property and debts; embargoes; kinds of property liable to capture; domicile; privateering; prizes; *jus postliminii;* rights and duties of neutrals; law of contraband; law of blockade; right of search; ship's papers; truces, passports, and treaties of peace; offences against the law of nations; piracy; slave-trade.

Outlines of maritime law.

Lectures.

Text-book.—Woolsey's International Law.

HISTORY.—Origin and ethnological grouping of Aryan, Semitic, and Turanian nations; outlines of history, especially the history of Greece and Rome, of the Holy Roman Empire, and of the states of Western Europe down to 1872; historical geography; progress of colonial development in America; history of the United States; naval history; lectures.

Text-books.—Freeman's General Sketch of History, with Labberton's Historical Atlas; Eliot's History of the United States, with modern atlases.

RHETORIC AND COMPOSITION.—Essential properties of style; classification of sentences; rules for the construction of sentences; figures of rhetoric; exercises in the composition of themes and official reports.

Text-book.—Bain's Rhetoric.

ENGLISH.—Historical development of the English language; relation of English to the other Aryan languages; changes wrought by foreign influence on the grammar, vocabulary, and pronunciation. Etymology; inflexional changes since the Conquest. Syntax; analysis of sentences.—Readings from classical authors, with applications of the principles of grammar, and exercises in analysis and in tracing the etymological meaning of words.—Classification of words; definition of words by usage and by derivation; synonyms; laws of change in the meaning of words by contraction, extension, and amelioration.—Faults in diction, and their remedies; selection and arrangement; elementary principles of reasoning.

Text-books.—Tancock's English Grammar and Reading Book; Seeley and Abbott's English Lessons; Hart's Manual of Punctuation.

DEPARTMENT OF MODERN LANGUAGES.

FRENCH AND SPANISH LANGUAGES.—Grammar; exercises in reading, writing, and conversation.

Text-books.—Fasquelle's French Grammar; Duffet's Grammar; Howard's Aid to French Composition; Prud'homme's French Nautical Phrases; Erckmann-Chatrian's Le Conscrit; Gasc's Dictionary; Roget's Spanish Manual; Tolon's Reader.

DEPARTMENT OF DRAWING.

Right-line drawing; free-hand drawing and perspective; topographical and chart drawing.

The foregoing studies are distributed over four years, and the Cadets are arranged n four classes, each class pursuing the course for the year.

PROGRAMME OF RECITATIONS FOR THE FIRST TERM.

From September 20, 1876, to January 27, 1877.

The time devoted to daily recitations is divided into three periods, indicated thus :—(1), (2), (3). (1) denotes first period, from 8.30 a. m. to 10.30 a. m.; (2) denotes second period, from 10.45 a. m. to 12.45 p. m.; and (3) denotes third period, from 2 p. m. to 4 p. m.

Practical exercises begin on Saturday at 10.45 a. m., and on all other days, except Sundays, at 4 p. m.

CADET-MIDSHIPMEN.

Department.	Periods.	Subjects.
	FOURTH CLASS—FIRST YEAR.	
Mathematics	M. T. W. Th. F. (2) S. (1)	Algebra and Geometry. Elective Course once a week.
English Studies, History, and Law.	M. T. W. Th. F. (1)	English and History.
Modern Languages	1st division, M. T. Th. (3) 2d division, M. W. F. (3)	French.
Drawing	1st division, W. F. (3) 2d division, T. Th. (3)	Line-drawing.
	THIRD CLASS—SECOND YEAR.	
Mathematics	M. T. W. Th. F. (1) F. (3)	Trigonometry and Descriptive Geometry. Descriptive Geometry. Elective Course once a week.
English Studies, History, and Law.	M. F. (2) W. (3)	History and Rhetoric.
Physics and Chemistry	T. W. Th. (2)	Elementary Physics.
Modern Languages	T. Th. (3)	French.
Drawing	M. (3) S. (1)	Sketching.
	SECOND CLASS—THIRD YEAR.	
Seamanship	M. (3) F. (2) S. (1)	Luce's Seamanship.
Ordnance and Gunnery	Th. (3)	Infantry Tactics.
Astronomy, Navigation, and Surveying	T. (3) W. Th. (2)	Astronomy.
Mechanics and Applied Mathematics	M. T. W. Th. F. (1)	Calculus. Elective Course twice a week.
English Studies, History, and Law.	One period a month	Composition.
Modern Languages	M. T. (2) W. F. (3)	French.
	FIRST CLASS—FOURTH YEAR.	
Seamanship	T. Th. F. (3)	Naval Construction.
Ordnance and Gunnery	T. (2) W. (3)	Ordnance and Armor.
Steam-Engineering	W. Th. (2) F. (1)	Marine Engines.
Astronomy, Navigation, and Surveying	M. T. W. Th. (1)	Navigation.
Physics and Chemistry	M. F. (2) S. (1)	Heat and Light.
Modern Languages	M. (3)	Spanish.

CADET-ENGINEERS.

Department.	Periods.	Subjects.
	FOURTH CLASS—FIRST YEAR.	
Mathematics	M. T. W. Th. F. (2) S. (1)	Algebra and Geometry. Elective Course once a week.
Steam-Engineering	1st division, W. F. (3) 2d division, T. Th. (3)	Mechanical Drawing
English Studies, History, and Law.	M. T. W. Th. F. (1)	English and History.
Modern Languages	1st division, M. T. Th. (3) 2d division, M. W. F. (3)	French.

CADET-ENGINEERS—Continued.

Department.	Periods.	Subjects.
	THIRD CLASS—SECOND YEAR.	
Mathematics	M. T. W. Th. F. (1)	Trigonometry and Descriptive Geometry.
	F. (3)	Descriptive Geometry. Elective Course once a week.
Steam-Engineering	M. (3) S. (1)	Mechanical Drawing.
Physics and Chemistry	T. W. Th. (2)	Elementary Physics.
English Studies, History, and Law	M. F. (2) W. (3)	History and Rhetoric.
Modern Languages	T. Th. (3)	French.
	SECOND CLASS—THIRD YEAR.	
Steam Engineering	M. Th. (3) F. (2) S. (1)	Mechanical Drawing, Marine Engines, and Fabrication of Machinery.
Astronomy, Navigation, and Surveying	T. (3) W. Th. (2)	Astronomy.
Mechanics and Applied Mathematics	M. T. W. Th. F. (1)	Calculus. Elective Course twice a week.
English Studies, History, and Law	One period a month *	Composition.
Modern Languages	M. T. (2) W. F. (3)	French.
	FIRST CLASS—FOURTH YEAR.	
Seamanship	T. Th. F. (3)	Naval Construction.
Steam-Engineering	M. T. W. Th. F. (1) W. (3)	Marine Engines, Fabrication and Designing of Machinery, Mechanical Drawing.
Physics and Chemistry	M. F. (2) S. (1)	Heat and Light.
Mechanics and Applied Mathematics	T. W. Th. (2)	Strength of Materials.
Modern Languages	M. (3)	Spanish.

* Theme Periods.—1. Sept. 23, S. (1), { C. M. Seamanship, C. E. Steam. } 2. Oct. 30, M. (1), Mechanics. 3. Nov. 27, M. (2), Modern Languages. 4. Dec. 27, W. (2), Navigation.

PROGRAMME OF RECITATIONS FOR THE SECOND TERM.

From January 29, 1877, *to June* 20, 1877.

CADET-MIDSHIPMEN.

Department.	Periods.	Subjects.
	FOURTH CLASS—FIRST YEAR.	
Mathematics	M. T. W. Th. F. (2) S. (1)	Algebra and Geometry. Elective Course once a week.
English Studies, History, and Law	M. T. W. Th. F. (1)	English and History.
Modern Languages	1st division, M. T. Th. (3) / 2d division, M. W. F. (3)	French.
Drawing	1st division, W. F. (3) / 2d division, T. Th. (3)	Topography.
	THIRD CLASS—SECOND YEAR.	
Mathematics	M. T. W. Th. F. (1)	Analytical Geometry and Descriptive Geometry. Elective Course once a week.
	M. (3)	Descriptive Geometry.
Physics and Chemistry	T. Th. F. (2)	Chemistry.
English Studies, History, and Law	M. W. (2) S. (1)	History and Rhetoric.
Modern Languages	T. W. Th. F. (3)	French.
	SECOND CLASS—THIRD YEAR.	
Seamanship	T. Th. (3) F. (2)	Luce's Seamanship.
	Th. (2)	Naval Tactics.
Ordnance and Gunnery	T. (2)	Ordnance Instructions.
Physics and Chemistry	M. W. (2) S. (1)	Physics.
Mechanics and Applied Mathematics	M. T. W. Th. F. (1)	Mechanics. Elective Course twice a week.
English Studies, History, and Law	One period a month †	Composition.
Modern Languages	M. W. F. (3)	Spanish.

* Theme Periods.—1. Sept. 23, S. (1), { C. M. Seamanship, C. E. Steam. } 2. Oct. 30, M. (1), Mechanics. 3. Nov. 27, M. (2), Modern Languages. 4. Dec. 27, W. (2), Navigation.

CADET-MIDSHIPMEN—Continued.

Department.	Periods.	Subjects.
	FIRST CLASS—FOURTH YEAR.	
Seamanship	M. W. (2) S. (1)	Luce's Seamanship.
Ordnance and Gunnery	M. Th. (3) T. (1)	Ordnance and Armor.
Steam-Engineering	W. F. (3) Th. (2)	Marine Engines.
Astronomy, Navigation, and Surveying	M. W. Th. F. (1)	Navigation and Surveying.
English Studies, History, and Law.	T. F. (2)	Public Law.
Modern Languages	T. (3)	Spanish.

CADET-ENGINEERS.

Department.	Periods.	Subjects.
	FOURTH CLASS—FIRST YEAR.	
Mathematics	M. T. W. Th. F. (2) S. (1)	Algebra and Geometry. Elective Course once a week.
Steam-Engineering	1st division, W. F. (3) 2d division, T. Th. (3)	Mechanical Drawing.
English Studies, History, and Law.	M. T. W. Th. F. (1)	English and History.
Modern Languages	1st division, M. T. Th. (3) 2d division, M. W. F. (3)	French.
	THIRD CLASS—SECOND YEAR.	
Mathematics	M. T. W. Th. F. (1)	Analytical Geometry and Descriptive Geometry.
	M. (3)	Elective Course once a week. Descriptive Geometry.
Physics and Chemistry	T. Th. F. (2)	Chemistry.
English Studies, History, and Law.	M. W. (2) S. (1)	History and Rhetoric.
Modern Languages	T. W. Th. F. (3)	French.
	SECOND CLASS—THIRD YEAR.	
Steam Engineering	T. Th. F. (2) T. Th. (3)	Mechanical Drawing, Fabrication of Machinery, and Marine Engines.
Physics and Chemistry	M. W. (2) S. (1)	Electricity.
Mechanics and Applied Mathematics	M. T. W. Th. F. (1)	Mechanics. Elective Course twice a week.
English Studies, History, and Law.	One period a month †	Composition.
Modern Languages	M. W. F. (3)	Spanish.
	FIRST CLASS—FOURTH YEAR.	
Steam-Engineering	M. W. Th. F. S. (1) W. Th. (2) Th. F. (3)	Marine Engines, Fabrication and Designing of Machinery, and Mechanical Drawing.
Physics and Chemistry	T. (1) M. W. (3)	Physical Measurements.
Mechanics and Applied Mathematics	M. (2)	Strength of Materials.
English Studies, History, and Law.	T. F. (2)	Public Law.
Modern Languages	T. (3)	Spanish.

†Theme Periods.—1. Feb. 2, F. (2), { C. M. Seamanship, C. E. Steam. } 2. Mar. 5, M. (1), Mechanics. 3. Apr. 4, W. (3), Modern Languages. 4. May 7, M. (2), Physics.

EXAMINATION-PAPERS—1875-76.

FOURTH CLASS.

DEPARTMENT OF MATHEMATICS.

ALGEBRA.

MONTHLY EXAMINATION.

DECEMBER 18, 1875.—*Time allowed, two and a half hours.*

1. What is meant by a root of an equation? What is a quadratic equation? Find the roots of the equation $ax^2 + bx + c = 0$, and find expressions for the sum of the roots, their product, the sum of their squares, and the sum of their cubes. Prove that every equation of the second degree must have two roots and no more. What relation must hold between the coefficients in order that the roots may be *real?* What that they may be *equal?* Form an equation whose roots are the squares of the roots of the equation $ax^2 + bx + c = 0$.

2. Let m denote the mass of the earth and n that of the sun, a the distance between their centres in miles. The attraction of gravitation varies directly as the mass, and inversely as the square of the distance from the centre of attraction. It is required to find the distance from the centre of the earth to the point where the attractions of the earth and sun are equal.

Find also the distance in miles, given $a = 95000000$ miles, and $\frac{n}{m} = 389376$.

3. Reduce $\sqrt{np + 2m^2 - 2m\sqrt{np + m^2}}$ to its simplest form.

Write the square root of each of the following quantities:

$28 + 10\sqrt{3}$, $67 - 16\sqrt{3}$, $11 + 6\sqrt{2}$, $x + y + z + 2\sqrt{xz + yz}$, and $2a + 2\sqrt{a^2 - b^2}$.

Solve the following equations (find all the roots):

$$\sqrt{x+5} = \frac{12}{\sqrt{x+12}}, \quad \sqrt{x^3} - 2\sqrt{x} = x, \quad \text{and}$$

$$\frac{54 - 9\sqrt{x}}{x + 2\sqrt{x}} = \frac{23x - 46\sqrt{x}}{6 + \sqrt{x}} + \frac{7x^2 - 3x + 4}{(x + 2\sqrt{x})(6 + \sqrt{x})}.$$

4. Solve the following equations, finding all the roots in each case:

$$\left.\begin{aligned} x + y + \sqrt{x+y} &= 12 \\ x^2 + y^2 &= 41 \end{aligned}\right\}, \quad \left.\begin{aligned} \sqrt{\frac{3x}{x+y}} + \sqrt{\frac{x+y}{3x}} &= 2 \\ xy - (x+y) &= 54 \end{aligned}\right\}, \text{ and } \left.\begin{aligned} y &= mx + a \\ \sqrt{x} + \sqrt{y} &= \sqrt{a} \end{aligned}\right\}.$$

5. Given $l = a + (n-1)d$, $s = \frac{n}{2}(a + l)$:

Eliminate n, and find a in terms of d, l, and s; also eliminate l, and find n in terms of a, d, and s.

Solve the equation $(x-1)^2 + (a-1)^2 = 2(ax + 1) + \sqrt{3(x+a)^2 + 4ax}$.

SEMI-ANNUAL EXAMINATION.

JANUARY 28, 1876.—*Time allowed, five hours.*

1. Simplify the expressions

$$\frac{2x}{3}(x+1)\left\{x+2-\frac{1}{2}(2x+1)\right\}, \quad \frac{a(a+b)+b^2}{a} \div \frac{b(a+b)+a^2}{b},$$

and

$$\frac{x}{6}(x+1)(x+2)+x(x-1)(x-2)+\frac{2x}{3}(x-1)(x+1).$$

2. Find the value of

$$\sqrt{\frac{3}{4}-x}+\sqrt{2x}-\frac{3}{2}\sqrt{1-4x} \text{ when } x=\frac{1}{12}.$$

Multiply

$$a^{n-1}b-a^{n-2}b^2+ab^{n-1} \text{ by } ab.$$

Find five terms of the product of

$$\left\{1+\frac{x}{2}+\frac{x^2}{3}+\frac{x^3}{4}+\ldots\ldots\right\} \text{ by } \left\{1-\frac{x}{3}+\frac{x^2}{5}-\frac{x^3}{7}+\ldots\ldots\right\}.$$

Write the n^{th} term of each of these series.

3. Multiply

$$a^{\frac{5}{2}}-2a^2b^{\frac{1}{3}}+4a^{\frac{3}{2}}b^{\frac{2}{3}}-8ab+16a^{\frac{1}{2}}b^{\frac{4}{3}}-32b^{\frac{5}{3}} \text{ by } a^{\frac{1}{2}}+2b^{\frac{1}{3}}.$$

Divide

$$m^2+2mp-n^2-2nq+p^2-q^2 \text{ by } m-n+p-q.$$

Divide

$$x^4+x^{-4}-x^2-x^{-2} \text{ by } x-x^{-1}.$$

4. Prove that a^n-b^n is divisible by $a-b$. Show that $x^{pq}-1$ is divisible by x^q-1, and write the *last* three terms of the quotient.

5. Separate into factors, x^2+5x+6, x^3+4x^2+3x, ax^2y-axy^2, $9x^4-6x^2y^2+y^4$, a^4+1, a^4+64, and x^4+6x^2+121.

6. Reduce each of the following fractions to its simplest form:

$$\frac{x^2+(a+c)x+ac}{x^2+(a+b)x+ab}, \quad \frac{4x^2-12ax+9a^2}{8x^3-27a^3}, \quad \text{and} \quad \frac{ax^m-bx^{m+1}}{a^2bx-b^2x^2}.$$

7. Find the greatest common divisor of

$$6a^3+19a^2b+8ab^2-5b^3 \text{ and } 15a^4+10a^3b+4a^2b^2+6ab^3-3b^4.$$

If $x+a$ be the greatest common divisor of x^2+px+q and x^2+rx+s, what is the value of a in terms of p, q, r, and s?

8. Simplify the expressions

$$\frac{1}{x-1}-\frac{1}{2(x+1)}-\frac{x+3}{2(x^2+1)} \text{ and } \frac{x^{3n}}{x^n-1}-\frac{x^{2n}}{x^n+1}-\frac{1}{x^n-1}+\frac{1}{x^n+1}.$$

9. Solve the equations

$$\frac{1}{4}(x+6)-\frac{1}{12}(16-3x)=\frac{25}{6}, \text{ and } \frac{1}{16}(3x+3)+\frac{1}{15}(7x-4)-\frac{1}{20}(7x+1)=2.$$

10. Solve the equations

$$\frac{x}{a}-1-\frac{dx}{c}+3ab=0, \text{ and } \frac{1}{ab-ax}+\frac{1}{bc-bx}=\frac{1}{ac-ax}.$$

11. Solve the equations

$$\frac{x-y}{x+y}=\frac{1}{5}, \quad \frac{4}{7}\left\{\frac{2x}{3}-\frac{5y}{12}\right\}-\frac{2}{23}\left\{\frac{3x}{2}-\frac{y}{3}\right\}=2,$$

and

$$\frac{x}{a+b}+\frac{y}{a-b}=2a, \quad \frac{x-y}{4ab}=1.$$

12. *A* and *B* start together from the same point to walk round a circular course, after half an hour, *A* has walked three complete circuits, and *B* four and a half; assuming that each walks with uniform speed, find when *B* next overtakes *A*.

13. Find the cube root of .00375 to five decimal places.

Find the square root of $a^2 - x^2$ to four terms.

14. Simplify

$$\frac{1+\sqrt{3}}{2\sqrt{2}-3\sqrt{3}} \text{ and } \sqrt{18+2\sqrt{77}}.$$

Find the value of

$$\frac{\sqrt{a+x}+\sqrt{a-x}}{\sqrt{a+x}-\sqrt{a-x}} \text{ when } x=\frac{2ab}{b^2+1}.$$

15. Solve the equations

$$\sqrt{4a+x}=2\sqrt{b+x}-\sqrt{x},$$

$$\sqrt{a+\sqrt{x}}+\sqrt{a-\sqrt{x}}=b\sqrt{a^2-x};$$

16. $x^2+\sqrt{x^2-5}=11$, and $mqx^2-mnx+pqx-np=0$.

17. Develop $\frac{a^2}{(a^3-x^3)^{\frac{2}{3}}}$ to five terms by the binomial formula.

18. Solve the equations

$$\frac{a-\sqrt{2ax-x^2}}{a+\sqrt{2ax-x^2}}=\frac{x}{a-x};$$

19. $x^3+3axy+y^3=b^3$, $x+y=c$; $(x+1)^5+(x-1)^5=19\left\{(x+1)^3+(x-1)^3\right\}$.

20. Find all the values of x and y which will satisfy the equations

$$(x^2+1)(y^2+1)=10, \text{ and } (x+y)(xy-1)=3.$$

ANNUAL EXAMINATION.

JUNE, 1876.—*Time allowed, five hours.*

1. Find the value of the expression

$$\left\{\frac{a^2 b^{\frac{1}{7}}+1}{c^{\frac{11}{6}} d^3+5}\right\}^{\frac{1}{11}},$$

given $a=8.24186$, $b=.00044034$, $c=561875$, $d=9.42552$.

2. Find the value of each of the expressions

$$\varepsilon^{\pi}, \quad \pi^{-\frac{1}{\varepsilon}}, \text{ and } \sqrt[20]{\frac{1}{\pi^{19}\varepsilon^{19}}}. \qquad \left[\pi=3.1416,\ \varepsilon=2.7183.\right]$$

3. Solve the equations—

$$a+x+\sqrt{a^2+bx+x^2}=b \quad \text{and} \quad \frac{1}{\sqrt{1-x}+1}+\frac{1}{\sqrt{1+x}-1}=\frac{1}{x}.$$

4. Find x and y from the equations

$$xy+\frac{x}{y}=\frac{5}{3}, \quad \frac{1}{xy}+\frac{y}{x}=\frac{20}{3}.$$

5. Find x and y from the equations $y=mx+\frac{a}{m}$, $y^2=4ax$; and solve the equation $x^3+8=2x^2+11x+14$.

6. Expand $(a-b)^{-\frac{1}{3}0}$ to five terms, and write the first three and last three terms of

$$\left\{\sqrt{x}+\sqrt[3]{y}\right\}^{15}.$$

7. The m^{th} term of an arithmetical progression is n, and the n^{th} term is m; find the first term, the common difference, and the sum of $(m+n)$ terms.

Prove that the sum of the cubes of any three even numbers in arithmetical progression is divisible by 24.

8. The equation $x^4-4x^3+16x-16=0$ has equal roots; find all the roots.

Diminish the roots of the equation $2x^4-17x^3+53x^2-72x+36=0$ by unity, and thence solve it.

9. Find all the roots of the equations $x^5 - 14x^4 + 58x^3 - 56x^2 - 59x + 70 = 0$ and $x^8 + 1 = 0$, and find a root of the equation $x^3 + 6ax^2 = 36a^3$.

10. The r^{th} term of $(1-x)^{-\frac{1}{2}}$ is p and the r^{th} term of $(1-x)^{-\frac{3}{2}}$ is q; find the value of $\frac{q}{p}$ in terms of r. Solve the equation

$$x\sqrt{\frac{x}{y}} + y\sqrt{\frac{y}{x}} = 34,\ x - y = 12.$$

GEOMETRY.

ANNUAL EXAMINATION.

JUNE, 1876.—*Time allowed, four hours.*

1. Prove that the sum of the angles of any plane triangle is two right angles. Deduce an expression for the sum of all the angles of a polygon of n sides. If the polygon is regular, what is each angle? Prove that in an isosceles triangle the angles opposite the equal sides are equal.

2. Prove that the straight lines which bisect two adjacent supplementary angles are perpendicular to each other. Prove that, if through the middle point of one side of a triangle a straight line be drawn parallel to the base, it will bisect the other side, and the intercepted portion will be equal in length to one-half the base.

3. Prove that, in any triangle, the bisector of an angle, or of its exterior angle, divides the opposite side, internally or externally, into segments which are proportional to the adjacent sides.

4. Prove that the square described on the hypothenuse of a right triangle is equivalent to the sum of the squares described on the other two sides.

5. Prove that a triangular pyramid is one-third of a triangular prism of the same base and altitude, and that the frustum of a triangular pyramid is equivalent to the sum of three pyramids, &c., &c.

6. Define spherical triangle. Explain what is meant by the term *polar triangle*, and state the relation between the parts of a spherical triangle and those of its trihedral angle at the centre of the sphere. Prove that, in two polar triangles, each angle of one is measured by the supplement of the side lying opposite to it in the other.

7. A right triangle $A\,C\,B$, whose sides $C\,A$ and $C\,B$ are respectively 12 and 5, is placed with the vertices A and B on two lines $O\,A$ and $O\,B$, which meet at right angles; it is required to find the perpendicular distance of the vertex of the right angle C from each of the lines $O\,A$, $O\,B$, and the length of the line $O\,C$. Given that the angle $O\,A\,B = B\,A\,C$.

8. A cone is circumscribed about a sphere, and its height is double the diameter of the sphere (radius a). Compare the surfaces and volumes of the cone and sphere.

9. Find the volume of a regular tetrahedron (edge a). A regular hexagon revolves about (1) a line joining two opposite vertices, (2) a line joining the middle points of two opposite sides. Compare the surfaces and volumes of the solids generated.

ALGEBRA.

ELECTIVE COURSE.

Cadet-Midshipmen Abner B. Clements, John Hood, Charles S. Ripley, R. S. Sloan, and F. A. Woodworth.

Cadet-Engineers Richard Gatewood, F. T. Bowles, W. M. McFarland, and M. D. Noell.

JANUARY, 1876.—*Time allowed, five hours.*

1. Given $\sqrt{x} + \sqrt{y} = \sqrt{a}$. $y = mx + b$. Find values of x and y in terms of a, m, and b, find the relation which must hold between b, a, and m, in order that x and y may each have but *one* value, and substitute the corresponding value of b, in terms of a and m, in the second of the given equations.

2. Construct the loci of the equations in the preceding question when $a = 4$ and $m = 2$.

3. Given $y = \frac{x^2 - 2mx + p^2}{x^2 + 2mx + p^2}$, find the limiting values of y. Make a sketch of the locus represented by the above equation.

4. Deduce formulas for the sum of the natural numbers from 1 to n, the sum of their squares, and the sum of their cubes. Prove the latter formula by mathematical induction.

5. If the number of combinations of $2n$ things taken $n + 1$ together be to the number of combinations of $2(n-1)$ things taken n together as 132 is to 35, find n. Prove the formulas used.

6. Out of $2n$ men who are to sit at the sides of a long table, p particular men wish to sit on one side and q on the other; find the number of ways in which the company may be arranged.

The p^{th} term of an arithmetical progression is $\frac{1}{q}$ and the q^{th} term is $\frac{1}{p}$; find the sum of pq terms.

7. Find the sum of n terms of the series 5, 55, 555, 5555, &c.

Prove that $2^{\frac{1}{4}} \cdot 4^{\frac{1}{8}} \cdot 8^{\frac{1}{16}} \cdot 16^{\frac{1}{32}} \ldots\ldots$ *ad infinitum* is equal to 2.

8. On the perpendicular of an equilateral triangle whose side is a, a second equilateral triangle is formed; on the perpendicular of this another, and so on indefinitely. Find the sum of the areas of all these triangles, and the sum of their perpendiculars.

9. Find approximate values of x and y from the equations $y^2 - 2xy + 2x^2 + 4y - 18x + 4 = 0$, and $y^2 + 2xy + x^2 - 24y - 31x + 144 = 0$, by constructing the two loci on the same axes.

10. The series of natural numbers is arranged in groups, thus, 1; 2, 3, 4; 5, 6, 7, 8, 9; and so on. Prove that the sum of the numbers in the n^{th} group is $n^3 + (n-1)^3$.

THEORY OF EQUATIONS.

ELECTIVE COURSE.

Cadet-Engineers Richard Gatewood, Walter M. McFarland, and F. T. Bowles.
Cadet-Midshipmen Abner B. Clements and Charles S. Ripley.

JUNE, 1876.—*Time allowed, five hours.*

1. Let $f(x)$ denote any rational integral function of x. Substitute $x + y$ for x; write $f(x+y)$ arranged according to the ascending powers of y, and show how the coefficients of the expansion are formed.

Prove that $\frac{x f'(x)}{f(x)} = n + \frac{S_1}{x} + \frac{S_2}{x^2} + \ldots\ldots \frac{S_m}{x^m}$, where S_m denotes the sum of the m^{th} powers of the roots.

2. Prove that if the equation $x^3 - px^2 + qx - r = 0$ have two equal roots, the third root must satisfy either of the equations $x(x-p)^2 = 4r$, and $(x-p)(3x+p) + 4q = 0$.

3. Determine the relation between q and r necessary in order that the equation $x^3 + qx + r = 0$ may be put into the form $x^4 = (x^2 + ax + b)^2$, and thence solve the equation $8x^3 - 36x + 27 = 0$.

4. Give an explanation of Horner's method of approximation, and find a root of the equation $x^4 - 12x + 7 = 0$ to five decimal places by this method.

5. Express a root of the equation $x^3 + x^2 + x - 7 = 0$ as a continued fraction, and give five convergents.

6. Find by Sturm's theorem the number and position of the real roots of the equation $x^4 - 4x^3 - 3x + 23 = 0$.

7. Transform the equation $34x^5 + 80x^4 + 80x^3 + 40x^2 + 10x + 1 = 0$ to another in which the fourth term is wanting; thence solve the equation.

8. Trace the curve $x^3 - x^2y - a^2x + 4a^2y = 0$; find the maximum and minimum ordinates, and the point of inflexion.

DEPARTMENT OF ENGLISH STUDIES, HISTORY, AND LAW.

HISTORY.

SEMI-ANNUAL EXAMINATION.

JANUARY 26, 1876.—*Time allowed, five hours.*

[Starred (*) questions are alternatives.]

1. To what group and family of nations do the Russians belong? the Wallachians? the Turks? the English? the Bretons? the Arabs? the Swedes? the Finns? the Portuguese? (Take five.)

2. Give the dates of any five of the following: 1. Danish occupation of England (beginning and end). 2. Magna Charta. 3. Hegira. 4. First Punic war (two dates). 5. Alexander's expedition. 6. Battle of Marathon. 7. Great Interregnum (two dates). 8. First Crusade.

3. Explain the names (or expressions):—1. Constantinople. 2. Caliph. 3. Languedoc. 4. Patriarch. 5. Austria. 6. Marquess. 7. Regular clergy. 8. Crossing the Rubicon. (Take four.)

4. Tell something about any three of the following:—1. Aetius. 2. Charles Martel. 3. Alfred. 4. Frederick Barbarossa. 5. Charles the Bold. 6. Edward the Black Prince.

5. Name the four families that reigned successively as Roman emperors between 800 and 1250 A. D., and give the names of the rulers of any one of these families in the order of their reigns.

6. (*a*) "The history of the East does not give the same political teaching as that of the West." How so?

(*b*) What was the Aryan dispersion?

6*. Compare the geographical character of Greece and Italy, and show how each influenced the character of the people.

What races and principles were represented by Athens and Sparta respectively in the Peloponnesian war?

7. "The old Roman constitution was really democratic, but it had a tendency to become practically aristocratic." Explain these terms, and show how the change came about.

7*. "Before the time of Diocletian, the empire had become a military monarchy." Explain.

8. How did Switzerland come to be an independent state?

8*. Explain feudal tenure, showing how it originated, and what were its effects.

9. What were some of the effects of the crusades?

9*. Show how Mahometanism, in the fifteenth century, both gained and lost ground in Europe? (Give dates.)

10. Draw a map of Western Europe, in the time of Otto the Great, putting down the boundaries of the Roman Empire, Kingdom of Burgundy, Duchy of Burgundy, Kingdom of France (Francia), Duchy of Normandy. Note also the position of Laon, Paris, Toulouse, Arles, Mainz, Trier, Constanz, Ravenna, Milan, Florence, Rouen, Dijon, Tours, and the following rivers: Rhone, Rhine, Ebro, Weser, Po, Loire, Elbe, Seine, Garonne.

HISTORY OF THE UNITED STATES.

ANNUAL EXAMINATION.

JUNE 15, 1876.—*Time allowed, five hours.*

[Starred questions (*) are alternatives.]

1. Name the colonies in 1688, and give the form of government in each at that time.

1*. Four colonial wars: dates; causes; corresponding wars in Europe; treaties. State the territorial changes accomplished by the last three.

2. Give some account of (1) Sir E. Andros, (2) Lord Cornbury, (3) Burr, (4) Truxtun, (5) Garrison, (6) Barron. (Take three.)

3. Give a brief account of the operations of the Navy during the war with Mexico.

3*. Show the connection between the legislation under which Missouri was admitted as a State and that under which Kansas was organized as a Territory.

4. Explain the terms (1) patroon, (2) proprietary government, (3) writs of assistance, (4) articles of confederation, (5) quartering acts, (6) tariff, (7) excise. (Take four.)

5. Explain the Monroe doctrine, and give an account of its application in 1866–67.

5*. State the measures included in the compromise of 1850, and give an account of the contest which ended in their adoption.

6. Give an account of the movements which led to the constitutional convention.

6*. Describe the proceedings in the Continental Congress which led to the adoption of the Declaration of Independence.

7. Name in order the six ministries in England between 1762 and 1775, and refer to each the acts which were initiated by it relating to the colonies.

7*. Explain the difference between the taxes of which the colonies complained and those to which they made no objection.

8. Administrations, 1789–1869: dates; President and Vice-President. Refer the following to the administrations in which they belong: 1. Jay's treaty; 2. Embargo; 3. Florida purchase; 4. Webster-Ashburton treaty; 5. Secession ordinance in South Carolina; 6. Ostend manifesto.

9. Give some account of the following: 1. Jones's cruise in the Ranger; 2. Mission of Genet; 3. Southampton massacre; 4. Dred Scott case; 5. Crittenden compromise; 6. Geneva arbitration. (Take three.)

10. Draw a map showing the boundaries of the Louisiana cession of 1803 and of the territory from which slavery was excluded by the Missouri compromise.

ENGLISH GRAMMAR.

SEMI-ANNUAL EXAMINATION.

JANUARY 24, 1876.—*Time allowed, five hours.*

[Starred questions (*) are alternatives.]

PUNCTUATION.

1. Give the rules for the use of points in connection with marks of parenthesis in the following cases:

(1) When, in the absence of a parenthesis, no point would be needed;

(2) When, in the absence of a parenthesis, a comma would be needed;

(3) When the parenthesis needs a point of its own.

ENGLISH.

2. Show that English is a Teutonic rather than a Romance language.

3. What is meant by the terms "classical Latin" and "revival of letters"? In what four ways did Latin influence English?

3*. "The Northmen, who had become Frenchmen in France, became Englishmen in England." Explain.

4. Explain the formation of *vixen ; children ; alms ; third* from *three ; one* in the sense of *they ; ought.*

5. Explain the terms *aorist tense, finite verb, analytic stage* in a language, *co-ordinative conjunction.*

6. Explain the three classes of subordinate clauses.

6*. Explain the case of the end or object.

7. "O kind hosts and dear, (1)
Hearken a little unto such a tale (2)
As folk with us will tell in every vale (3)
About the yule-tide fire, when the snow (4)
Deep in the passes, letteth men to go (5)
From place to place: now there few great folk be, (6)
Although we upland men have memory (7)
Of ills kings did us; yet as now indeed, (8)
Few have much wealth, few are in utter need." (9)

Turn the poetry into prose of the present day. Explain the construction of *dear* (1), *hearken* (2), *little* (2), *deep*, (5), *there* (6), *be* (6), *us* (8).

8. What can you say about the number of *folk* (6)? the form of *letteth* (5)? the difference between *few* (6) and *few* (9)? the direct object of *did* (8)?

9. Explain the principal parts of *tell* (3), *letteth* (5), *did* (8). Explain the formation of *yule-tide* (4), *upland* (7), *indeed* (8).

10. "Once in an ancient city, whose name I no longer remember,
Raised aloft on a column, a brazen statue of Justice
Stood in a public square, upholding the scales in its left hand,
And in its right a sword, as an emblem that justice presided
Over the laws of the land, and the hearts and homes of the people."

Analyze.

ENGLISH LESSONS.

ANNUAL EXAMINATION.

JUNE 13, 1876.—*Time allowed, five hours.*

[Starred (*) questions are alternatives.]

1. Name the six laws of linguistic change, and give an illustration of each, showing from the etymology of the word how the law applies.

1*. Distinguish by the method of elimination between the words *wisdom* and *ingenuity*, between *monarch* and *autocrat.* (Take either pair of words, but not both.)

2. What is *fine writing*, and how is it to be avoided? When are poetic quotations and periphrases admissible?

3. What is the best broad rule for writing English prose? To what qualifications is this rule subject?

4. Explain personification, expressed metaphor, psychological phenomena, ballad, romance, plot, epic poem.

4*. What is the aim of scientific composition? How does it differ in this respect from non-scientific composition?

What rules govern the arrangement of argument in oratory?

5. Explain briefly the difference between induction and deduction. Explain the *argument from analogy.*

6. Explain the difference between definition and description, and between essentials and accidents, giving examples.

Explain *syllogism, variable middle, begging the question.*

7. The common proverb "Fortune favors fools" is found in various forms in all the languages of Europe. To what sources of error is it due that such a proposition obtains popular credence?

8. Ill-doers are ill-dreaders. This man dreads evil, and is, therefore, a scoundrel.

Explain the error, and draw a diagram.

8*. No branch of science can be made absolutely perfect, yet all branches of science are worthy of diligent culture.

State the inference, draw diagram, and explain.

[In answering 8 (or 8*), designate the middle term, minor term, major premise.]

9. Unpleasant things are not always injurious; afflictions are often salutary.

Supply the missing premise.

9*. All cold is expelled by heat: this person's disorder is a cold; and must, therefore, be expelled by heat.

Explain and point out the error.

10. Prose version:

"Thus sang the uncouth swain to the oaks and rills,
While the still morn went out with sandals gray;
He touched the tender stops of various quills,
With eager thought warbling his Doric lay:
And now the sun had stretched out all the hills,
And now was dropped into the western bay;
At last he rose and twitched his mantle blue;
To-morrow to fresh woods, and pastures new."

Explain the figures.

DEPARTMENT OF MODERN LANGUAGES.

FRENCH.

ANNUAL EXAMINATION.

JUNE 10, 1876.—*Time allowed, four hours.*

Translate into French the following sentences:

1. Where were you going when I met you this morning?

2. I was going to market with my friend; then we went to Mr. B.'s store to purchase some things that we needed.

3. Can you tell me if you bought anything in market or at the store you visited?

4. Yes; we found some large strawberries and other nice things to eat; but, spending all our money, we were unable to purchase anything at Mr. B.'s store.

5. Tell me the names of some other things which you found for sale at the market; for I am a stranger here, and know very little of what they have to sell.

6. Well, there were poultry, fish, beef, lamb, pork, potatoes, corn, fresh eggs, and all other things generally sold in market.

7. How long is it since you came to the Naval Academy?

8. I have been here these two years, and I must say that I am much pleased with the Academy. It is very agreeable; but we have to study a good deal: our lessons are long, and, besides, we have to drill every day.

9. When the weather is bad, what do you have to do?

10. Sometimes we remain at home, but generally our instructors find something for us to do. On Mondays we drill as infantry; on Tuesdays as artillery. On Wednesdays we have nothing to do—have study-hours. On Thursdays we go to the ships, and on Fridays we do everything.

11. Are you permitted to have any leave of absence during your stay at the Naval Academy?

12. That depends upon circumstances: if we study our lessons, and behave well during the time we are here, we are permitted to visit our families once in four years. If any one at home should be ill, or should die, then we are permitted to go home, if it is not too far.

13. In what State do you live when you are at your home?

14. I live in the State of New Jersey, near the sea-coast; but we have a railroad and steamboats on the river where the city in which I live is situated.

15. When you go into the country, do you ever go hunting or fishing?

16. Not often: there is no game in the country where I live; but there is a good deal of fishing, though one must be careful not to remain out after the sun sets.

17. Will you please tell me how often each day you receive your letters by the post?

18. The first year that I came here we used to get our mail but once a day; now we receive our letters twice a day, and they talk of having three mails a day.

19. Is your uncle to come back soon from his long voyage?

20. We do not know when he intends to return. His last letter was written in the month of January. He says he is not far from the desert of S.

21. When do you intend going to France for your son, who is there at school?

22. Not yet; I am only going to see him. He has been long enough in France to be able to speak French fluently. I suppose he will be anxious to return with me.

23. Somebody told me yesterday that Miss M. was going to marry neighbor H.'s son. Is it true?

24. Really, I cannot say; but he is certainly very attentive to the young lady. She is very pretty, well educated, and rich.

25. What have you been doing to-day?

26. I walked the whole morning, breakfasted at twelve, and went out in the afternoon to call on an old friend, who lives in William street, near the corner.

Give the primitive tenses and the conjugation in all simple tenses, and the first person of all compound tenses of the following verbs:

Être, manger, aller, recevoir, venir, and *prendre.*

THIRD CLASS.

DEPARTMENT OF MATHEMATICS.

TRIGONOMETRY.

MONTHLY EXAMINATION.

NOVEMBER 22, 1875.—*Time allowed, two and a half hours.*

All formulas used to be deduced by Napier's rules, and the work to be checked. Write the formulas in order, and number them, draw a diagram for each case, and work to the nearest second.

1. In a right triangle, given a, 30° 30′ 45″; B, 120° 30′ 45″. Solve the triangle.
2. Given A, 100° 30′ 30″; b, 10° 30′ 30″; c, 79° 29′ 30″. Find B and a.
3. Given A, 100° 30′ 30″; C, 79° 29′; b, 10° 30′ 30″. Find B and a.
4. Given A, 110° 30′; B, 60° 30′; b, 50° 30′. Find a and c.
5. Given b, 69° 34′ 30″; c, 120° 30′; B, 50° 10′. Solve the triangle.

MONTHLY EXAMINATION.

DECEMBER 6, 1875.—*Time allowed, two and a half hours.*

[Solutions of five questions required.]

1. Define the terms *horizon, prime-vertical, meridian, altitude, declination.* What points are the poles of the meridian? of the prime-vertical? Explain what is meant by the *astronomical triangle,* and name its parts. In the stereographic projection of the sphere where is the point of sight, and on what plane is the projection made? What two important advantages has this method of projection? Show that $D = r \tan \frac{1}{2} \theta$, where D

denotes the distance of the projection of a point from the centre of the primitive circle, r the radius of the sphere, and θ the polar distance. Assuming that the subcontrary section of an oblique cone with a circular base is a circle, show that the stereographic projection of any circle of the sphere is a circle, and find expressions for the distances of the extremities of one of its diameters from the centre of the primitive circle.

2. Prove that the angle between any two tangents to circles of the sphere is equal to the angle of their projections. Show how to find the line which contains the centres of the projections of all great circles passing through a given point, and give a proof of the construction. Prove that the *line of centres* coincides with the projection of a circle whose polar distance is equal to the supplement of the inclination of the pole.

3. Given L, 44° 50′ N.; t, 60° 10′ W.; d, 59° 45′ N.; find h and Z. (Deduce formulas by Napier's rules in terms of the given parts.)

4. Given t, 22° 30′; d, 29° 55′ 30″ N.; h, 59° 51′ 30″. Find L.

5. Make a stereographic projection of the triangle in (3) on the plane of the prime-vertical and on the plane of the meridian, and project the triangle in (4) on the plane of the equator. In these projections only the *given* parts are to be used, taking them to the nearest degree.

6. At a place in north latitude, when the sun's declination was 22° 30′ N., the altitude of the sun was 45°, and 3 hours later the altitude was 60°. Find the latitude by making a stereographic projection on the plane of the equator. The result must be stated in degrees and minutes. Determine also from the projection the times of observation.

SEMI-ANNUAL EXAMINATION.

JANUARY, 1876—*Time allowed, five hours.*

[Solutions of 18 questions required.—Without tables.]

1. Define the trigonometric ratios. Deduce formulas showing the relation between the sine and cosine, the relation between the tangent and secant, and the relation between the chord and sine. Deduce the trigonometric ratios of 30° and 45°.

2. Write the formulas for the sine and cosine of $(x \pm y)$, and thence deduce formulas for the sine, cosine, and tangent of $2x$ and $\frac{1}{2}x$, and for tan $(x \pm y)$ and tan $(y \pm 45°)$.

3. Find the sine, cosine, and tangent of each of the angles 15°, 22° 30′, and 18°.

4. Given $y = \sec^{-1}\frac{x}{a}$; find the sine, cosine, and tangent of y.

Find x from the equation $\cos^{-1} x + \cos^{-1}(1 - x) = \cos^{-}(-x)$,

and z from the equation $\tan^{-1}\frac{1}{z-1} - \tan^{-1}\frac{1}{z+1} = \frac{\pi}{12}$.

5. In a right triangle, given an angle A and its opposite side a, find expressions for the radii of the circumscribed and inscribed circles.

Solve the equation $\sec\theta = 2\tan\theta$.

6. In a plane oblique triangle, given A, B, and c, find the remaining parts.

7. In a plane oblique triangle, given a, b, and C, find the remaining parts.

8. State and prove the theorem which shows the relation between the three sides and one angle of a triangle.

Given the three sides 3, 5, and 7, find the greatest angle.

9. Deduce formulas for the solution of the *three-point problem* (the diagram must be drawn and explained).

10. Deduce formulas for the logarithmic solution of the equations

$$\tan(a + z) = m\tan z, \text{ and } m\cos z + n\sin z = q.$$

11. State and prove De Moivre's theorem.

Write the sine, cosine, and tangent of $4x$ in terms of the functions of x.

12. Assuming the formula $\cos a = \cos b\cos c + \sin b\sin c\cos A$, deduce the formula $\sin A\sin b = \sin B\sin a$.

13. Deduce the formulas used in the solution of spherical right triangles.

14. Deduce the formula $\sin^2 \frac{1}{2} A = \frac{\sin (s-b) \sin (s-c)}{\sin b \sin c}$, and apply it to the astronomical triangle to find t. Arrange the work for computation.

15. Given the declination of the sun and the latitude of the place, show how to find the time of sunset. Given the latitudes L_1 and L_2 and the longitudes λ_1 and λ_2 of two places on the earth, show how to find the distance between them.

16. The sides of a plane triangle are $2\sqrt{\ }$ $\sqrt{6}$, and $3 - \sqrt{3}$; find the angles.

17. Given $a \cos \phi + b \cos \theta = c$, $a \sin \phi - b \sin \theta = d$, and $2 \sin^2\left(\frac{\theta + \phi}{2}\right) = \cos \frac{\pi}{3}$, find the relation between a, b, c, and d.

18. A vessel sailing NNE. sees two light-houses in line, bearing ESE.; 2 hours afterwards the light-houses bore SSE. and S., the distance between them being 6 miles; find the rate of the ship.

19. Solve the equations

$$\sin x + \sin y = \cos x + \cos y = \tfrac{1}{2}\sqrt{6},$$

$$\cos^{-1}\left(\frac{1-x^2}{1+x^2}\right) + \tan^{-1}\left(\frac{2x}{1-x^2}\right) = \frac{4\pi}{3}.$$

20. What is the distance of the sea horizon from an observer whose eye is 18 feet above the level of the sea? Answer required in yards and miles. (Radius 4000 miles.)

SEMI-ANNUAL EXAMINATION.

JANUARY, 1876.—*Time allowed, five hours.*

Solutions of nine questions required.

1. Find the log tangent of 317° 30′ 30″, log cosine of −111° 30′ 30″, and log secant of 269° 30′ 30.″

Find an angle between 2π and 4π whose sine is negative, and whose cotangent is 0.275.

Given $u = \theta (\tan \theta)^{\tan \theta}$, find u when $\theta = 15°$.

The hypothenuse of a right triangle is 7040003 and one side is 7040000; find the included angle.

2. Given two sides of a plane triangle 2820.9 and 1430.8, and the included angle 107° 27′ 40″, solve the triangle, and find the perpendicular from the vertex of the least angle upon the opposite side.

3. In a quadrilateral $ABCD$, given AD, 2345; CAD, 42° 17′; CAB, 37° 53′; CDB, 46° 32′; and BDA, 38° 51′; find BC.

4. Solve the equations $k \cos (\alpha + z) = m$, and $k \cos (\beta + z) = n$; given α, 100° 18′; β, 35° 10′; m, −0.5734; and n, 0 4527 (k positive).

Solve the equation $ax^2 + bx + c = 0$, given a, 2.527; b, 3.452; c, −2.432.

5. Given the three sides of a plane triangle, a, 32.235; b, 51.125; c, 40.156; find A from the formula $a^2 = b^2 + c^2 - 2bc \cos A$; B from $\sin^2 \frac{1}{2} B = \frac{(s-a)(s-c)}{ac}$; and C from $d = \frac{(b+c)(b-c)}{a}$, $\cos C = \frac{a+d}{2b}$.

6. In a spherical triangle, given A, 110° 27′; B, 70° 23′; c, 64° 20′; find C and a (Napier's rules).

7. Given a, 65° 34′; b, 53° 24′; C, 80° 20′; solve the triangle by Napier's analogies and the fundamental formula.

8. Given t, 70° 20′; d, 23° 25′ N.; h, 25° 22′; find L and Z.

9. A vessel sails from a place in latitude 30° 30′ N., longitude 75° W., and follows the arc of a great circle, her course at starting being NE. ½ E. What latitude and longitude will she be in after sailing 3500 nautical miles.

10. Given $x = \cot L \sin \theta$, $y = L + \cot L - \cot L \cos \theta$, $\theta = \pi \sin L$; find values of x and y corresponding to values of L at intervals of 15° from 90° to 0°, and trace the curve.

ANALYTICAL GEOMETRY.

SEMI-MONTHLY EXAMINATION.

FEBRUARY 18, 1876.—*Time allowed, two and a half hours.*

Solutions of five questions required.

1. Deduce the following equations to the straight line: (*a*) In terms of m and c; (*b*) in terms of the intercepts; (*c*) in terms of a and p.

Deduce the equation to a straight line which passes through (x_1, y_1) with the direction ratio m, and the equation to a line passing through (x_1, y_1) and (x_2, y_2).

2. Find the equations to straight lines passing through (h, k) and making an angle β with $y = mx + c$. What forms do these equations take when $\beta = \frac{\pi}{2}$? Find the length of the perpendicular from (h, k) upon $y = mx + c$.

3. Deduce formulas by which the axes may be turned through any angle, the origin remaining fixed; when both systems are oblique, and when both systems are rectangular.

4. Find the equations to the following lines; (*a*) Joining $(-3, 4)$ and $(5, 2)$; (*b*) perpendicular to (*a*) at its middle point; (*c*) passing through $(4, -5)$ parallel to $5y + 3x - 7 = 0$; (*d*) passing through $(2, 4)$ and making an angle of 45° with $3y - 4x - 9 = 0$.

Find the angle between the lines $5y + 4x - 7 = 0$ and $2y - x + 8 = 0$, and the length of the perpendicular from (3, 2) upon $12y - 5x - 30 = 0$.

5. Construct the locus of the equation $x^2 + y^2 + xy + 18(x + y) + 96 = 0$.

Find what this equation becomes when the origin is taken at the centre of the curve, and what the resulting equation becomes when the axes are turned through an angle of 45°.

6. A right angle moves so that its vertex is constantly on the axis of Y, while one of its sides passes through a point on the axis of X at a distance a to the right of the origin; from the point $(-a, 0)$ a perpendicular is let fall upon the other side. It is required to find the equation to the locus of the foot of this perpendicular, and to trace the curve from its equation.

ANNUAL EXAMINATION.

JUNE, 1876.—*Time allowed, five hours.*

1. Find the angle between the lines $7x + y = 61$ and $4y + 3x = 56$. Find the area of the triangle formed by these lines and the axis of Y. Find the equation to a perpendicular let fall upon the second of the given lines from the point where the first crosses the axis of Y; find also the lengh of this perpendicular.

2. A right triangle $A\,C\,B$ is placed with the vertex A on the axis O Y, and the right angle C on the axis O X, the vertex B being in the first angle. Find the co-ordinates of B and the equation to the sides of the triangle, given $A\,C = 4$, $B\,C = 3$, and the angle $O\,C\,A = 60°$.

3. Find the equation to the tangent to $x^2 + y^2 = a^2$ in terms of its direction ratio m.

Find the equation to a circle passing through the origin and the points $(7, 1)$, $(-1, 7)$.

Find the general equation to the circle in oblique co-ordinates.

4. Find an expression for the perpendicular from the focus of the parabola $y^2 = 4ax$ upon the tangent. (In terms of m).

Find the polar equation to the parabola, pole at focus, and an expression for the length of a focal chord.

Find the equations to all the normals to $y^2 = 4ax$ which pass through $(9a, -6a)$.

5. Deduce the equation to the ellipse referred to conjugate diameters.

Prove that the area of the parallelogram which touches the ellipse at the extremities of conjugate diameters is constant.

Express the equations to the tangent and normal to the ellipse in terms of the eccentric angle.

6. Deduce the equation to the hyperbola referred to its asymptotes as axes, and the equation to the tangent in terms of its direction ratio referred to the same axes.

Find the polar equation to the locus of the foot of the perpendicular let fall from the centre of an equilateral hyperbola upon the tangent.

7. Find the co-ordinates of the centre and the eccentricity of the conic

$$34x^2 - 32xy + 34y^2 - 4x - 104y - 344 = 0.$$

Find the equation to the axis of the parabola

$$(y - x)^2 = a(x + y).$$

8. Suppose the triangle given in example (2) to move so that the vertices A and C remain constantly on the axes. Find the equation to the locus of B, and also the locus of the middle point of $A\,B$.

9. Find the equations to those tangents to the ellipse $a^2 y^2 + b^2 x^2 = a^2 b^2$ which pass through $\left(\frac{a}{e}, \frac{b^2}{ae}\right)$. Find the equation to the locus of the middle points of focal chords of the ellipse.

10. Parabolas are drawn passing through the origin and intercepting a distance a on each axis. Find the locus of the intersection of the tangent at the origin and the tangent at the point $(0, a)$.

DIFFERENTIAL CALCULUS.

ELECTIVE COURSE.

Cadet-Midshipmen J. H. Fillmore, J. H. Glennon, J. G. Quinby, T. S. Rodgers, H. S. Knapp, and F. L. Young.

Cadet-Engineers I. N. Hollis, F. J. Schell, H. W. Spangler, G. H. Bull, and G. W. McElroy

JANUARY, 1876.—*Time allowed, five hours.*

1. Deduce formulas for the differentiation of x^2, $\sqrt{x}$, xy, $\frac{1}{x}$, and $\frac{x}{y}$.

2. Deduce the differentials of $\log x$ and a^x, and, by means of the formula for $d(\log x)$, deduce the differential of x^n.

3. *Write* the differentials of $\sin x$, $\cos x$, $\tan x$, $\sin^{-1} x$, and $\tan^{-1} x$, and *deduce* those of $\text{versin}^{-1} x$, $\log \sin x$, $\log \tan x$, $\sin \log x$, and x^x.

4. Differentiate the expressions $\frac{x}{\varepsilon^x - 1}$.

$$\log\left\{\sqrt{1+x^2} + \sqrt{1-x^2}\right\}, \text{ and } x + \log\cos\left\{\frac{\pi}{4} - x\right\}.$$

5. Differentiate $\tan^{-1}\varepsilon^x$, $\frac{x\sqrt{a^2 - x^2}}{2} + 2\sin^{-1}\frac{x}{a}$,

and

$$\tfrac{1}{6}\cdot\log\left\{\frac{(x-1)^2}{x^2+x+1}\right\} - \frac{1}{\sqrt{3}}\tan^{-1}\frac{2x+1}{\sqrt{3}}.$$

6. Given $u = x^5 - 5x^4 + 5x^3 - 1$, find the values of x for which u is a maximum or minimum.

What sector must be cut from a given circle (radius a), in order that the remainder may form the *curved* surface of a cone of maximum volume?

7. Given $x^4 - 2ay^3 - 3a^2y^2 - 2a^2x^2 + a^4 = 0$, find the value of $\frac{dy}{dx}$ at all the points where the curve crosses the axes.

8. Find the value of $\frac{1 - x + \log x}{1 - \sqrt{2x - x^2}}$ when $x = 1$; of $x\tan x - \frac{\pi}{2}\sec x$, when $x = \frac{\pi}{2}$, and of $\frac{\sin(\alpha+\beta)\sin(\alpha+x) - \sin\beta\sin x}{\sin(\alpha+\beta+x)}$, when $x = \pi - (\alpha+\beta)$.

9. The equations to a meridian in the polyconic projection are

$$x = \cot L \sin\theta,\ y = L + \cot L - \cot L \sin\theta.$$

Find the value of x and y for $L = 0$ and $\frac{dy}{dx}$ for $L = 30^\circ$, $p = \pi$. ($\theta = p \sin$ L.)

10. The equation to a curve being $(x+3)\,y^2 = (y+4)\,x^2$, find the equations to the asymptotes and construct them; find the maximum and minimum ordinates and abscissas; find the equations to the tangents at the origin, and trace the curve.

DIFFERENTIAL AND INTEGRAL CALCULUS.

ELECTIVE COURSE.

Cadet-Engineers H. W. Spangler, F. J. Schell, I. N. Hollis, and G. H. Bull.
Cadet-Midshipmen J. H. Fillmore, J. G. Quinby, J. H. Glennon, and T. S. Rodgers.

JUNE, 1876.—*Time allowed, five hours.*

1. Demonstrate Taylor's theorem and deduce La Grange's form of the remainder.

2. Expand $\epsilon^{x \sin x}$ to five terms in powers of x.

3. Prove that if $u = \frac{F(x)}{f(x)}$ and $F(x)$ and $f(x)$ both vanish when $x = a$, then the value of u when $x = a$, is $\frac{F'(a)}{f'(a)}$.

Find the value of $\frac{\theta^2}{1-\cos m\theta}$ when $\theta = 0$, of $x^{\frac{1}{1-x}}$ when $x = 1$, and of $x^{\frac{a}{\log \sin x}}$ when $x = 0$.

4. Trace the curve $\frac{y}{a} = \sqrt{\frac{x}{2a-x}}$ and find the points of inflexion.

5. Find the equation to the evolute to the equilateral hyperbola.

6. A straight line cuts, from the co-ordinate axes, intercepts a and b, such that $na + b = c$. Find the equation to the envelope of these lines.

7. Trace the curve $y^4 + ax^2(2y - x) = 0$, and find the area of the loop.

8. Integrate the expressions $\frac{x\,dx}{(a^4 - x^4)^{\frac{1}{2}}}$, $\frac{dx}{\sin^2 x \cos^2 x}$, $\frac{\sin^{-1} x\,dx}{(1-x^2)^{\frac{1}{2}}}$, and $\frac{x\,\epsilon^x\,dx}{(1+x)^2}$.

9. Integrate $\frac{x^2\,dx}{x^4 + x^2 - 2}$, $\frac{dx}{(1+x^2)(1-x^2)^{\frac{1}{2}}}$, and $\int_0^{\frac{\pi}{2}} \cos^8 x\,dx$.

10. A circular segment whose arc is 90° revolves about its chord; find the volume generated.

DEPARTMENT OF PHYSICS AND CHEMISTRY.

ELEMENTARY PHYSICS.

SEMI-ANNUAL EXAMINATION.

JANUARY, 1876.—*Time allowed, five hours.*

1. When are different bodies equal in mass?

2. State the laws of gravitation.

3. With what velocity must a body be projected downwards in order to strike the earth with a velocity of 200 feet per second after moving 5 seconds?

4. A vessel contains water to the depth of 1 decimetre. One side of this vessel is a rectangular surface, the bottom of which is 1 decimetre, while the side slopes at an angle of 45°. What is the total pressure on this side?

5. A piece of gun-metal weighs 1.5 kilogammes in the air and 1.33 kilogrammes in

water; the metal is an alloy of tin (specific gravity, 7.3) and copper (specific gravity, 9). In what proportions do these metals enter into the composition?

6. State, and illustrate by an example, the doctrine of the conservation of energy.

7. How is sound transmitted?

8. Upon what does the velocity of sound depend?

9. Upon what does the intensity of sound depend?

10. If the velocity of sound in one gas be known, how may its velocity in other gases be found?

11. What are the two fixed points used in graduating a thermometer? and how is the one marking the higher temperature determined?

12. What are the readings of — 10° C. and 400 C. on the Fahrenheit scale? what on absolute scale?

13. What must be the diameter of a cast-iron shot at 15° C. to be fired red-hot (900° C.) from a IX-inch gun, allowing $\frac{1}{10}$ inch windage? Coefficient of expansion (linear) of iron .000011.

14. A quantity of gas measures 1 litre at 10° C. and 770 millimetres pressure. What will be its volume at 30° C. and 760 millimetres?

15. One kilogramme of ice at 0° is placed in 5 kilogrammes of water at 60° C., and the temperature is reduced to 44° C. What is the latent heat of liquefaction by this experiment?

16. Define specific heat. How does the specific heat of a substance vary with change of state?

ANNUAL EXAMINATION.

JUNE, 1876.—*Time allowed, four hours.*

1. State the laws of the reflexion of light, and apply them to determining the focus of a concave spherical reflector.

2. An object 10 centimetres high is placed successively at distances of 1 metre, 40 centimetres, 20 centimetres, 15 centimetres, and 5 centimetres, from a concave mirror of 20 centimetres radius. Find the position and magnitude of the image for each position of the object.

3. Explain the phenomena of reflection and single refraction by the undulatory theory.

4. An object 10 centimetres high is placed successively at distances of 5 metres, 1 metre, and 10 centimetres, from a double convex lens of 30 centimetres focal length. Find the position and magnitude of the image for each position of the object.

5. Compare the radiation from polished platinum, green glass, and black porcelain, when viewed in a white-hot chamber; explain why they appear differently when viewed at this same temperature outside the chamber.

6. Describe electro-static induction, and explain by it the action of the plate electrical machine.

7. Describe fully the construction and action of an electrical condenser. How may it be discharged?

8. State Ampère's theory of magnetism, and explain by it the directive action of currents upon magnets.

9. Explain the construction of an astatic system. How is it applied in the galvanometer to determine the direction and measure the strength of a current?

10. Describe the induction of currents of electricity by other currents.

CHEMISTRY.

ANNUAL EXAMINATION.

JUNE, 1876.—*Time allowed, five hours.*

1. Nitric acid of sp. gr. 1.5 contains 92.98 per cent. of HNO_3. What volume of this acid will be required to convert 500 grammes of glycerine into tri-nitro-glycerine? What weight of tri-nitro-glycerine will be obtained?

2. Describe tri-nitro-glycerine and the method by which it is manufactured. Show by graphic formulas the structure of the glycerine and tri-nitro-glycerine molecule. What is a nitro-substitution product?

3. In the following reaction find the numerical coefficients: a $Hg C_2 N_2 O_2$ + b K Cl + c $H_2 O$ = w K Cl + x $Hg Cl_2$ + y Hg O + z $H K_2 C_3 N_3 O_3$.

4. We have a hydrocarbon which we find by analysis belongs to the series $C_n H_{2n}$. 3.1360 grammes of the substance yields 1196 cm.³ of gas at 45° C. and 74 cm. of pressure. What is its formula? Explain your work.

5. From 5 cm.³ of P (sp. gr. 1.8), what volume of gaseous hydrogen phosphide will be obtained at 15° C. and 74 cm. of pressure? Illustrate the volume composition of gaseous hydrogen phosphide, and show what would be its condensation ratio if obtained by the direct union of H and P.

6. Prove that the sp. gr. (referred to H) of a substance in the state of a gas gives us one-half its molecular weight.

7. Describe sulphur.

8. Give the empirical formulas, chemical names, and molecular weights of the following substances: India saltpetre, oil of vitriol, sal ammoniac, muriatic acid, chloride of lime, charcoal, common salt, gypsum.

9. Define valency; atomicity. How can we show that if the valency of an element is ever odd it is always odd? Point out the valency of each element in the following compounds: H I, C H_4, $H_2 O_2$ S O_2, C O_2, H_4 N O H, N I_3, K C N.

10. What is gunpowder? To what does it owe its energy? What is the philosophy of its composition? What advantages does sodium nitrate possess over potassium nitrate? Which is used in regulation powder? Why?

Substitute for question (7.)—Describe fully, with reactions, the preparation of O in the laboratory.

DEPARTMENT OF ENGLISH STUDIES, HISTORY, AND LAW.

HISTORY AND RHETORIC.

SEMI-ANNUAL EXAMINATION.

JANUARY 25, 1876.—*Time allowed, five hours.*

RHETORIC.

[Starred (*) questions are alternatives.]

1. Distinguish between:—1. Loose sentence and period; 2. Clearness and simplicity; 3. Genus and species; 4. Concrete and abstract; 5. Subject world and object world; 6. Example and illustration. *Take three.*

2. Explain:—1. Mixed metaphor; 2. Fable; 3. Synecdoche; 4. Illative conjunction; 5. Unity; 6. Description; 7. Narrative; 8. Exposition; 9. Induction; 10. Deduction. (Take five.)

3. Explain what is meant by plurality of knowledge, and show what connection it has with antithesis.

3*. When is the use of hyperbole justifiable, and what are the limitations upon its use?

4. "The more general a notion is, the more difficult it is to conceive." Explain.

4*. Discuss Herbert Spencer's principle that qualifying words should precede the objects which they qualify.

5. Show that originality is a condition of strength; and explain why compositions sometimes have the power to please after frequent repetition.

5*. Give the main rules for the structure of the paragraph.

6. Explain the importance of chronology and geography in historical narrative.

6*. (*a*) What is meant by saying that some nations have a geography, but not a history?

(*b*) "The framing of summaries is conducted in a variety of ways." Name some of them.

7. What rules govern the choice of examples used to illustrate a scientific exposition?

7*. "The proof of a principle indirectly contributes to its exposition." Show this.

8. How may "obverse iteration" be used to aid exposition?

8*. Explain definition by analysis.

9. Make up sentences which shall contain the words given below, used as examples of the figures named:

1. Simile.	Dream, river.
2. Metaphor.	Fountain, heart.
3. Personification.	Savage, humor.
4. Paradox.	Skull, roar.
5. Antithesis.	Weary, stain.
6. Hyperbole.	Frenzy, whisper.
7. Climax.	Storm, folly.

10. Write a simple, clear, condensed narrative of an event or incident, real or fictitious, witnessed or supposed to have been witnessed by you, which shall, as far as possible, follow the principles given in the text-book. The narrative shall be at least one page in length, and shall contain at least two paragraphs.

HISTORY AND RHETORIC.

ANNUAL EXAMINATION.

JUNE 14, 1876.—*Time allowed, five hours.*

[Starred (*) questions are alternatives.]

RHETORIC.

1. Name and explain the four methods of inductive proof. Show what other forms persuasion may take beside that of argument.

2. Characterize the following argument, and point out fully its defects: "As there could be in natural bodies no motion of anything, unless there were some that moveth all things, and continueth immovable; even so in political societies there must be some unpunishable, or else no man shall suffer punishment."

CONSTITUTION OF THE UNITED STATES.

3. Define or explain direct tax, common law, charter government, bill of attainder, grand jury, *ad valorem* duties.

4. Explain the operation of the writ of *habeas corpus*, and show when and by whose authority it may be suspended.

4*. What things are necessary to a legal contract? What may a State do, and what is it forbidden to do, in regard to contracts?

5. What was the purpose of the electoral college? How does the system work in practice?

5*. State and give the reason for the constitutional prohibitions on members in regard to holding office.

6. State the qualifications for Representatives; for electors of Representatives; for Senators; for President; for Vice-President.

6*. What is the prohibition on the houses of Congress in regard to adjournment? On what does the duration of the sessions of Congress depend? Explain the "call for the yeas and nays"; the method, the real or ostensible object, and the process.

7. With whom rests the power to prescribe regulations for holding elections of Representatives? to try impeachments? to fill senatorial vacancies during the recess of

the State legislature? to permit officers to receive foreign decorations? to appoint consuls? to appoint militia officers? to declare war? to make treaties? to admit new States?

8. Explain equity jurisprudence, concurrent and exclusive jurisdiction, original and appellate jurisdiction. In what cases does the Supreme Court exercise appellate jurisdiction?

OFFICIAL REPORT.

9. Write an official report of the practice-cruise of 1875, addressed to the Commandant of Cadets, in the form prescribed.

DEPARTMENT OF MODERN LANGUAGES.

FRENCH.

SPECIMEN-QUESTIONS.

JUNE, 1876.—*Extempore translation from French into English.*

Quelques jours après, la gazette annonça que l'empereur était à Paris, et qu'on allait couronner le roi de Rome et l'impératrice Marie-Louise. M. le maire, M. l'adjoint et les conseillers municipaux ne parlaient plus que des droits du trône, et même on fit un discours exprès dans la salle de la mairie. C'est M. le professeur Burguet l'aîné qui fit ce discours, et M. le baron Parmentier qui le lut. Mais les gens n'étaient pas attendris parce que chacun avait peur d'être enlevé par la conscription, on pensait bien qu'il allait falloir beaucoup de soldats; voilà ce qui troublait le monde et pour ma part j'en maigrissais à vue d'œil. M. Goulden avait beau me dire: "Ne crains rien, Joseph, tu ne peux pas marcher. Considère mon enfant qu'un être aussi boiteux que toi resterait en route à la première étape."

Tout cela ne m'empêchait pas d'être rempli d'inquiétude.

On ne pensait déjà plus à ceux de la Russie, excepté leurs familles. M. Goulden quand nous étions seuls à travailler, me disait quelquefois.

Si ceux qui sont nos maîtres, et qui disent que Dieu les a mis sur la terre pour faire notre bonheur peuvent se figurer, au commencement d'une campagne, les pauvres vieillards les malheureuses mères auxquels ils vont en quelque sorte arracher le cœur et les entrailles pour satisfaire leur orgueil; s'ils pouvaient voir leurs larmes et entendre leurs gémissements au moment où l'on viendra leur dire: "Votre enfant est mort. Vous ne le verrez plus jamais! il a péri sous les pieds des chevaux, ou bien écrasé par un boulet, ou bien dans un hôpital, au loin—après avoir été découpé—dans la fièvre, sans consolation, en vous appelant comme lorsqu'il était petit," &c., &c.

1. Explain the rules of contraction and elision.
2. How are adjectives usually placed in French?
3. Explain places of the pronouns and how many kinds there are.
4. Explain the uses of the imperfect and past definite tenses.
5. How distinguish the conjugations in French?
6. Explain idioms with *faire*.
7. What verbs are used to express approximate future and a past just elapsed?

CONVERSATION IN FRENCH.

WRITTEN EXAMINATION.

Time allowed, two hours.

[Translate into French.]

(1) If you wish to be wise, and esteemed by mankind, be exact in the fulfilment of all your duties, assiduous in your business, and polite to everybody.

(2) Sir Isaac Newton, who lived eighty years, wore during winter his summer clothes

in order to accustom himself to all changes of the atmosphere and to all degrees of temperature without being inconvenienced by them.

(3) History, it is said, is philosophy teaching by example; but it is also the picture of times and men, and is consequently the image of inconstancy, caprice, and endless variations.

(4) The distingnishing characteristic of a Roman was love for liberty and his country. One of these things made him love the other: since because he loved his liberty he also loved his country, as a mother who brought him up in sentiments equally generous and free.

(5) One is astonished at beholding so much magnificence in the sepulchres of the Egyptians, but we must remember that, besides that they were erected as sacred monuments to carry to future ages the memory of great princes, they were also considered as eternal dwelling-places.

(6) What is religion? A sublime philosophy which demonstrates the order, the unity of nature, and explains the enigma of the human heart, the most powerful motive to urge man on to well-doing, since faith places him continually under the eye of God, and acts upon the will with as much power as upon thought: it enjoins, strengthens, and brings to perfection all virtues.

SECOND CLASS.

DEPARTMENT OF SEAMANSHIP.

SHIP-BUILDING.

SEMI-ANNUAL EXAMINATION.

JANUARY, 1876.—*Time allowed, four hours.*

WOODEN-SHIP-BUILDING.

1. Describe the keel, explaining fully the manner of uniting the different lengths, and how the keel is connected with the stem and stern-post.

What is the length of the keel-scarph?

Where do the nibs of the scarph come? Why?

Where do the butts of the keelson come?

Elevation and plan-sketches of keel.

When ready to receive the frames, what marks should be on the keel?

2. Describe a square frame; long and short arm floors, stating the names of the different timbers composing it, and the manner of uniting them.

How does the framing differ when first futtocks are used? What are cant frames? Why are they necessary?

Describe *raising* and *regulating* the ⊖ frame, and how frames are made to retain their proper form while being raised and regulated.

What are ribbons and harpins, where placed, how secured? What are filling-timbers, chocks, and hawse-pieces?

3. Name the different parts of the deck-frame. Describe the manner of ascertaining the lengths of deck-beams and manner of securing a deck-beam in place.

What portion of the deck-frame is worked next after the beams? Why?

4. How are mast-partners worked? Describe the framing of a hatch. What are waterways, where placed, how secured? How are the deck-planks placed and secured?

5. Make a sketch of sectional view of a ship, showing outside and inside planking, sheer-plank, and hammock-nettings, and describe the same fully.

6. What is the object of diagonal bracing? Describe the different methods of diagonally bracing modern ships, stating which method is most often adopted, and why. Describe the different kinds of *rudders*. How is an equipoise rudder connected to a ship?

7. Describe the different kinds of docks used.

Describe the manner of docking a vessel in a dry-dock, also in a sectional dock.

8. Describe the fittings and preparations necessary to get a ship ready for launching. How is a ship launched? How prevent *hogging* in a long ship when launching?

IRON SHIP-BUILDING.

Time allowed, four hours.

1. Illustrate and describe the different forms of keels used in the *transverse* system of framing. Illustrate and describe the entire keel-arrangement of an *iron-clad ship* built on the *bracket-plate* system. Give *sectional, plan,* and *elevation sketches.* Why are *internal vertical keels* necessary? Describe the different forms in use.

2. Make an *outline* sketch of the stem of an *iron-clad ram.* Show, by *sectional* sketches how it is connected with the keel and outside plating; and show how the *body* and *rudder-posts* are connected with the keel.

3. Describe the different kinds of framing, and how the frames are bent. Describe the *bracket-plate* system of framing, explaining fully the manner of dividing the double bottom into water-tight compartments. Illustrate the method of forming the *armor-shelf.*

4. Illustrate and describe briefly the different systems of plating (*sectional sketches.*) State the advantages or disadvantages of each system.

Define *liners,* state their use, and show how they are made in connection with the *water-tight* compartments.

5. In the system of plating now in general use, describe fully the manner of fitting *plates,* (giving size of rivets, and taking account of *rivet-holes,* using templates.) What is meant by *sheathed and composite ships?* State, in general terms, the reasons given for building such vessels. Make a *sketch* of one system of sheathing vessels.

6. Describe *armor, backing, plating,* and *framing behind armor.* How is *armor secured?* Describe the *fastenings* and the general *size* of *bolts.*

7. Make *sectional* drawings of the different forms of beams; name and describe them briefly.

How are the beams *spaced* in a man-of-war? What is the rule for *size of beams* of a vessel?

Describe *deck-stringers* and their use.

Illustrate and describe the different methods of forming the *beam-arms.*

8. Describe the manner of forming a *transverse water-tight* bulkhead; illustrate the manner of connecting it with the *ship's side.* Show how *longitudinal bulkheads* are made water-tight in connection with deck and T beams.

NAVAL TACTICS.

ANNUAL EXAMINATION.

JUNE, 1876.—*Time allowed, four hours.*

1. What is a general signal? how made?

How may a division, squadron, or vessel be exempted from obedience to a general signal?

What is a special signal? how made?

When is a manœuvre commenced?

What is the speed-signal (day and night)? how made?

2. The fleet being in column of vessels, in natural order, heading north, form it into double columns of vessels, abreast by divisions, heading NE. ½ N., in natural order State fully how the courses are signaled.

3. The fleet being in double columns of vessels, abreast by divisions, in natural order, heading NE. ½ N., form it into column of vessels, on the centre division, in natural order, and preserving the orginal direction.

4. The fleet being in columns of vessels, abreast by divisions, in natural order, heading N., form it into column of vessels, on the right division, with the van leading, course SW. ½ S.

5. The fleet being in column of vessels, in close order, form it into open order, on any vessel which may be designated.

The fleet being in double columns, in open order, form it in close order on any vessel which may be designated. State the distances between the vessels in each case.

6. The fleet being in double column on the centre, heading north, form it into line to the right or left, at right angles to the original direction (three methods).

7. The fleet being in line, heading north, form it into echelon of vessels from the right, preserving the original direction.

The fleet being in echelon of vessels, heading north, form it into double echelon from the left-centre vessel, preserving the original direction.

8. The fleet being in columns of vessels abreast by divisions, by the wind, and *headed off*, restore its order on the same tack. The wind *veers* aft; restore its order on the same tack.

SEAMANSHIP.

ORAL EXAMINATION—SPECIMEN QUESTIONS.

JUNE, 1876.

I.

1. Reeve, cut, and fit main topgallant braces.
2. How do you furl a square sail?
3. Get sheet-anchors ready for use, bend their chains, &c.
4. Cut, fit, and set up main-stays; wire rope.
5. Set a topmast studding sail.
6. Wind on the quarter, studding sails set; bring by the wind on the same tack.

II.

1. Reeve, cut, and fit main-topsail halliards.
2. Describe a main-sail; state how it is fitted.
3. Get ready for and hoist in a launch on port side.
4. Cut, fit, and set up main topgallant stay; wire rope.
5. Take in a topmast studding sail.
6. Wind on the quarter, studding sails set; *man overboard;* what is to be done?

III.

1. Reeve, cut, and fit mizzen topgallant halliards.
2. Make up fore topmast staysail for bending; bend it.
3. Fore-mast in, rake sheers, and take in bowsprit.
4. Cut, fit, and set up main royal stay; wire rope.
5. Set a topgallant studding sail.
6. By the wind, under all plain sail; *man overboard;* what is to be done?

IV.

1. Reeve, cut, and fit fore topsail halliards.
2. Make up main-sail for bending.

3. Rig the lower mast-head, and set up rigging.
4. Cut, fit, and set up jib-guys; wire rope.
5. Take in a topgallant studding sail.
6. How do you wear ship short around?

V.

1. Reeve, cut, and fit fore royal braces.
2. Describe a royal; state how it is fitted.
3. Get up purchases, secure yard, and get in heavy gun over all.
4. Cut, fit, and set up bobstays; wire rope.
5. Set all the starboard studding sails.
6. How do you box-haul a ship?

VI.

1. Reeve, cut, and fit mizzen topsail halliards.
2. Bend and furl topgallant sails and royals.
3. Fit main stays of wire; set them up.
4. Cut, fit, and set up fore topgallant stay; wire rope.
5. Take in all starboard studding sails.
6. Tack ship, under all plain sail, fine breeze.

VII.

1. Reeve, cut, and fit main royal braces.
2. Describe a jib; state how it is fitted.
3. How is a fish-davit rigged and worked?
4. Fit odd shroud of mizzen rigging; wire rope.
5. Ship close-hauled, take one reef in the topsails.
6. How do you club-haul a ship?

VIII.

1. Reeve, cut, and fit lower studding-sail halliards.
2. Describe a spanker; state how it is fitted.
3. Fit topmast rigging of wire; place rigging on foretopmast head.
4. State in general terms how wire rope is made.
5. Set the topsails, giving all the orders, and stating what is done at each.
6. In tacking, your ship is not inclined to go around; what would you do?

IX.

1. Reeve, cut, and fit fore topmast-studding-sail halliards.
2. Bend a topmast studding sail.
3. How do you send up, place, and secure half-tops?
4. Fit odd shroud of fore or main rigging; wire rope.
5. Take in a main-sail, fresh breeze, by the wind.
6. Wind on the quarter, light breeze, bring by the wind on the same tack.

X.

1. Reeve, cut, and fit spanker brails.
2. Topmasts housed; get ready for and fid them.
3. Make preparations for and hoist out launch.
4. Cut and fit lower mast-head pendants; wire rope.
5. Take one reef in the topsails, ship before the wind.
6. Light weather, ship close-hauled; keep away ten points, and trim and make sail.

DEPARTMENT OF ORDNANCE AND GUNNERY.

INFANTRY TACTICS.

SEMI-ANNUAL EXAMINATION.

JANUARY, 1876.—*Time allowed, four hours.*

1. Give the kinds of commands; reasons for and advantages of "position of soldier," in detail.

2. Give cadence and length of *all* steps; principles of, and how instruct recruits in the direct step; and how instruct recruits to align themselves.

3. Describe rest on arms from carry; fire kneeling; right shoulder, from support. What parts of manual do guides, color-guard, and file-closers execute?

4. Form a company; form column of fours to the right; form line on the right in single rank.

5. Column of platoons at a halt, form company; advance by right of platoons.

6. Company on the march, deploy skirmishers forward; open fire advancing; rally by company.

7. Post a battalion of seven companies (by seniority); open ranks.

8. Column of fours, right in front, form close column of divisions on the right, and deploy it on the third division.

9. Change front obliquely to rear to protect right flank of battalion; open fire by file.

10. Battalion in column of fours, deploy forward as skirmishers; reinforce the skirmish-line; assemble the battalion.

DEPARTMENT OF ASTRONOMY AND NAVIGATION.

ASTRONOMY.

SEMI-ANNUAL EXAMINATION.

JANUARY, 1876.—*Time allowed, four hours.*

1. Define right ascension, declination, hour-angle, azimuth, amplitude, celestial latitude, celestial longitude, stating how each is measured. Define vertical circles, celestial horizon, upper branch of meridian, and line of nodes of a planet's orbit.

2. Explain the pendulum experiment which proves the rotation of the earth on its polar axis. How do trade-winds prove the same?

3. Show by a figure the equation of time. Define it in terms of the sun's right ascension and longitude, as well as in terms of hour-angle. Of what two parts is it composed, and what occasions each of the parts?

4. How mount a transit-instrument approximately in the meridian (reducing deviations to small quantities)?

5. Deduce Bessel's formula for the reduction to the meridian, showing parts by a figure.

6. How find the latitude by Talcott's method? Name instrument used and the method of taking the observation.

7. Define common and corrected establishment of a port. How find time of high water at a given place? What occasions the inequality of lunitidal intervals during the lunar month?

8. Project on the plane of the meridian the following astronomical triangle: $L = 30°$ N.; $t = 30°$ W.; $d = 45°$ N.; and the equator.

9. State the cause of the inequality of the solar days. What gives rise to the inequality between the solar and the sidereal day? Which is the longer? Define the tropical and the sidereal year. Which is used in our calendar, and why?

DEPARTMENT OF PHYSICS AND CHEMISTRY.

ELECTRICITY.

ANNUAL EXAMINATION.

JUNE, 1876.—*Time allowed, five hours.*

1. Two electrified spheres, A and B, are connected by a very fine wire. What will be the distribution of electricity? How will this distribution be affected, (1) if the potential of either sphere be changed? (2) if the size of either be changed?

2. What will be the effect upon a current flowing in a helix if the current be allowed to force out a magnet previously placed within the helix? what, if the magnet be forced back into the helix? Give reason for your answer in each case.

3. How is the horizontal component of the earth's magnetic intensity measured?

4. Describe the tangent-galvanometer, and the method of using it. Derive the expression for the current measured by it.

5. What weight of silver will be deposited per hour by a dynamo-electrical machine which develops an E. M. F. of 60 volts, when the resistance of the machine is 5 ohms and that of the electrolyte 9.5 ohms, the electro-chemical equivalent of silver being 0.00552 grammes?

6. The resistance of 1 metre of copper wire 1 millimetre in diameter is 0.02057 ohms. What length of copper wire 0.75 millimetres in diameter will be required for a shunt which will diminish 100-fold the sensibility of a galvanometer of 500 ohms resistance?

7. Show how to measure an unknown resistance, using Wheatstone's bridge. Prove the theory of the bridge.

8. The current necessary to fire a torpedo-fuse is 0.6 weber. The resistance of the fuse being 0.4 ohm and that of the leading wires 1.75 ohms, what will be the smallest number of cells, of E. M. F. 1.4 volts per cell and R. 2.5 ohms per cell, required to fire a torpedo, and how must they be arranged?

9. Draw diagrams and explain the construction of Farmer's dynamo-electric machine and torpedo firing key.

10. What are the requisites of a good marine compass? How are these requisites secured? Give the methods by which the magnetic moment of a compass-card may be determined.

DEPARTMENT OF MECHANICS AND APPLIED MATHEMATICS.

SEMI-ANNUAL EXAMINATION.

CALCULUS.

JANUARY 24, 1876.—*Time allowed, five hours.*

Ten solutions required.

1. A hatchway, whose diagonal is 8.64 feet, is enclosed between the spar-deck and the hold; required the length of the longest spar that can be passed below, providing the hold be 5 feet in depth.

2. Determine the angle which a rudder makes with the keel of a ship when its turning effect is the greatest possible.

Find the value of $\left(2-\frac{x}{a}\right)^{\tan\frac{\pi x}{2a}}$ when $x=a$.

3. Oil flows at a uniform rate into a conical oil-tank 3 feet in height, which stands on its base, filling the tank in 27 minutes; determine the rate at which the surface is rising at the end of 19 minutes; also when the surface reaches the top.

4. A vessel sailing due south, at the uniform rate of 8 knots per hour, is 20 miles no[illegible]rth

of a vessel sailing due east, at the rate of 10 knots per hour; at what rate are they separating at the end of $1\frac{1}{2}$ hours?

Show that the derivative of $\log\left(x+\sqrt{x^2-a^2}\right)+\sec^{-1}\frac{x}{a}$ is $\frac{1}{x}\sqrt{\frac{x+a}{x-a}}$.

5. If a point move along the axis of x, so that

$$t=\sqrt{\frac{a}{2\mu}}\left\{\sqrt{ax-x^2}-\frac{a}{2}\operatorname{vers}^{-1}\frac{2x}{a}\right\},$$

find the velocity at any point, and show that the acceleration is equal to $-\frac{\mu}{x^2}$.

6. Find the parallel on the earth's surface at which the difference between the geocentric and the geographical latitude is the greatest.

7. Deduce the requisite series, and compute $\log_e 163$.

8. Deduce Simpson's "three-eighths" rule for computing areas and volumes.

Find the value of $\frac{\tan x}{\log\left(x-\frac{\pi}{2}\right)}$ when $x=\frac{\pi}{2}$.

9. Deduce the equation to the loxodromic curve, and show that the entire length of its projection on the plane of the equator is $R\sec C$, where C is the course and R the radius of the earth.

10. A ship is constructed on the wave-line plan, the midship section being a semi-ellipse and the stem and stern-post vertical; deduce the formula for determining the displacement of the after-body, also that of the fore-body.

11. In example 10, find the distance of the centre of gravity of the fore-body from the midship section.

Trace the curve $r=1+\cos 3\phi$, and find the area of one of its loops.

12. A scuttle-butt has for its base an ellipse whose principal diameters are 52 inches and 28 inches, and for its top an ellipse whose principal diameters are 40 inches and 22 inches, and its height is 24 inches; required the number of wine-gallons of 231 cubic inches it will contain.

MECHANICS.

ANNUAL EXAMINATION.

JUNE, 1876.—*Time allowed, five hours.*

Eight solutions required.

1. A torpedo-spar 30 feet long and weighing 300 pounds is shackled to the ship's side directly under the fore-yard: the torpedo attached to the end of the spar is 4 feet in length and weighs 250 pounds; the topping-lift which supports the spar is made fast at a point 5 feet from the outer end of the spar, to which it is perpendicular: find the tension on the lift, the horizontal thrust, and vertical pressure on the shackle, the angle which the spar makes with the horizon being 30°.

Find the relation between the power and the weight in the differential axle.

2. A chain hangs over two pulleys placed at unequal heights above the ground; deduce the equation to the curve formed by the portion between the pulleys, and prove that the extremities are in the same horizontal plane.

3. Find the relation between the tensions at the two ends of a cord wrapped around a rough cylinder.

A weight of five tons is to be raised from the hold of a steamer by means of a single whip, the fall being taken to the drum of a steam-windlass; the diameter of the drum is 14 inches, that of the rope 2 inches, and the length of the crank 16 inches: find the force which a man must exert at the end of the fall when he has $3\frac{1}{2}$ turns round the drum, the coefficient of friction being 0.234; find also the power which must be applied at the end of the crank to hold it in equilibrium.

4. A wooden quadrangular pyramid weighing 50 pounds per cubic foot, whose base is 10 feet square and whose height is 12 feet, rests on one of its triangular faces: find the *work* required to turn it over on its base.

5. Find the time of vibration of a simple pendulum (three terms required).

6. A right cone, whose altitude is equal to twice the radius of its base, is suspended by its vertex and by a diameter of its base: determine the ratio of the times of vibration.

7. A smooth elastic ball is projected horizontally from the top of a tower 100 feet in height, with a velocity of 100 feet per second, and after one rebound describes a horizontal range of 40 feet: determine the coefficient of elasticity.

Determine the angle of elevation necessary that a shot may pass through a point given by its coordinates.

8. Prove that the depth of penetration of a spherical projectile is determined by the formula

$$S = \frac{w}{2\mu c^2 g \log_{10} e} \log_{10}\left(1 + \frac{u}{\lambda} V^2\right),$$

in which w denotes the weight in pounds, and c the calibre in inches.

Find the depth of penetration in oak of a ten-inch projectile, having a velocity of 1468 feet per second. $\lambda = 2329.4$, $\mu = 0.004328$.

9. A sluice-gate in the form of a semicircle of 4 feet radius turns on a horizontal axis. At what distance below the centre must this axis be placed, that the gate may open when the water rises to the height of 5 feet above the top of the gate?

10. Find the quantity of water that will flow per second through a circular 12-inch aperture in the side of a ship, tangent to the water-line.

11. A hemispherical diving-bell is sunk in water until the surface of the water in the bell bisects the vertical radius; find the distance between the surfaces of the water within and without the bell.

DEPARTMENT OF MODERN LANGUAGES.

FRENCH.

Oral examination.

JANUARY, 1876.—*Translation from French into English extempore.*

Le 15 janvier 1814, deux mois et demi après la bataille de Hanau, je m'éveillai dans un bon lit, au fond d'une petite chambre bien chaude ; et, regardant les poutres du plafond au-dessus de moi, puis les petites fenêtres, où le givre étendait ses gerbes blanches, je me dis: "C'est l'hiver!" En même temps, j'entendais comme un bruit de canon qui tonne, et le pétillement du feu sur un âtre. Au bout de quelques instants m'étant retourné, je vis une jeune femme pâle assise près de l'âtre, les mains croisées sur les genoux, et je reconnus Catherine. Je reconnus aussi la chambre où je venais passer de si beaux dimanches, avant de partir pour la guerre. Le bruit du canon seul, qui revenait de minute en minute, me faisait peur de rêver encore.

Et longtemps je regardai Catherine, qui me paraissait bien belle; je pensais: "Où donc est la tante Grédel? Comment suis-je revenu au pays? Est-ce que Catherine et moi nous sommes mariés? Mon Dieu! pourvu que ceci ne soit pas un rêve!"

À la fin, prenant courage, j'appelai tout doucement: "Catherine!" Alors, elle, tournant la tête, s'écria:

"Joseph ..... tu me reconnais?" "Oui," lui dis-je, en étendant la main.

Elle s'approcha toute tremblante, et je l'embrassai longtemps. Nous sanglotions ensemble.

Et comme le canon se remettait à gronder, tout à coup cela me serra le cœur.

"Qu'est-ce que j'entends, Catherine?"

"C'est le canon de Phalsbourg," fit-elle en m'embrassant plus fort.

"Le canon ?"
"Oui, la ville est assiégée."
"Phalsbourg ? . . . . . Les ennemis en France! . . ."
Je ne pus dire un mot de plus.

Translation from English into French.

Henry the Eighth, king of England, having quarrelled with Francis the First, king of France, resolved to send him an ambassador bearing to that prince haughty and threatening words. He chose for that purpose an English bishop in whom he had great confidence and whom he thought fitted for carrying out his design. The prelate having learned the occasion of his embassy, and fearing for his life if he should treat Francis the First with the haughtiness which his master required, represented to him the danger to which he exposed him, and earnestly entreated him not to give him that commission. "Fear nothing," said Henry the Eighth; "if the king of France should put you to death, I would cut off the heads of all the Frenchmen in my kingdom." "I believe you, sire," replied the bishop; "but permit me to tell you that of all the heads you would cut off not one would fit my body so well as my own."

Conversation in French.
Oral examination.

1. Explain the rules of contraction in French.
2. Explain the rules of elision.
3. What is the place of adjectives in French ?
4. Give some adjectives which do not follow the general rule of position.
5. Tell all about demonstrative pronouns and their variations.
6. Give the idioms formed with the verbs *avoir*, *être*, *aller*, and *faire*.
7. Explain the agreement of past participles.
Explain the subjunctive mood.
8. What verb is used in speaking of age.
9. Explain the formation of tenses.
10. Conjugate all moods and tenses of the verbs *aller*, *faire*, *bouillir*, *conclure*, and *coudre*.

Nautical phrases.—Translate into English.

1. Tout le monde en haut pour diminuer de voiles.
2. Sur la perpendiculaire de notre route.
3. Laissez tomber le point de la grand'voile sous le vent.
4. Rangez du monde sur l'amure de grand'voile.
5. Passe du monde sur le bord.
6. Embarquez le grand bras.
7. La batterie aux sabords.
8. Gréez les bonnettes de perroquet.
9. Veillez aux drisses des huniers.
10. Dressez le canot.

Translate into French.

1. Shorten in the lee main tack.
2. That ship is hull down.
3. All hands about ship.
4. All hands loose sails.
5. All hands reef topsails.
6. In topgallant-sails.
7. Prepare for action.
8. Clear the ship for action.
9. On which side shall we board that vessel ?
10. Heave to and I will send a boat on board.

DEPARTMENT OF MODERN LANGUAGES,

SPANISH.

ANNUAL EXAMINATION, JUNE, 1876.

Translate into Spanish the following French dialogue between a Spaniard and an American:

Spaniard. Comptez-vous aller voir l'exposition de Philadelphie?

American. Certainement, la fête séculaire de notre république, embellies des triomphes de l'agriculture, de l'industrie, et des arts du monde entier, est un évènement d'un double intérêt pour nous.

S. Cela est vrai, monsieur, et ce double intérêt sera partagé par bien des étrangers. L'exposition américaine, outre les produits de l'intelligence, et du travail présentés dans les expositions de Londres, de Paris et de Vienne, offre à la vue des penseurs, le spectacle d'une nation riche, heureuse, entièrement développée dans sa jeunesse; et ils s'en demanderont la raison. Vos institutions politiques sont exposées à Philadelphie aussi bien que le sont les triomphes de votre industrie, et de votre travail; et n'en doutez pas, ce produit de l'intelligence d'un grand peuple fera réfléchir bien des hommes, et, peut-être, bien des nations.

A. Ce compliment est très-flatteur, et je vous en sais bon gré. Vous pensez, donc, que c'est un succès?

S. Oui, monsieur, les choses nécessaires, utiles et agréables ont atteint ici un très-haut degré de perfection. Dans cet hémisphère vous pouvez soutenir la concurrence européenne. Quant aux beaux arts, et aux choses purement de goût, le triomphe est, peut-être réservé à d'autres nations, l'américain le reconnaîtra volontiers. Votre supériorité industriélle, l'abondance du pays, vos excellentes écoles publiques, vos institutions libérales, fixeront ici la demeure de plusieurs artistes et mécaniciens célèbres, attirés par votre exposition, et vous profiterez de leurs talents.

A. Nous nous reverrons à Philadelphie?

S. Cela va sans dire . . . . si Dieu le veut.

A. Vous avez raison; les accidents des chemins de fer et des bateaux à vapeur sont assez fréquents; il faut, donc, dire, "au revoir, si Dieu le veut!"

Conjugate in all their tenses and moods the irregular verbs: *Ser*, *asir*, *caber*, *conocer*, and *acertar*, &c., &c.

ORAL QUESTIONS.

1. What is the position of the pronouns "It" and to "It".
2. How when the verb is in the infinitive?
3. When both pronouns have to be made use of, which one comes first?
4. Explain when "*to be*" is to be translated by "ser" and when by "estar".
5. Translate "*this*" and "*that*", and give the meaning of the three ways by which both can be rendered in Spanish.
6. Give the months of the year in Spanish, &c., &c., &c.

FIRST CLASS.

DEPARTMENT OF SEAMANSHIP.

PRACTICAL SEAMANSHIP.

ORAL EXAMINATION, SPECIMEN-QUESTIONS, JUNE, 1876.

I.

1. Describe the watch, quarter, and station bills of a frigate; state in general terms the information given by them, naming the different station bills.
2. How are the collars of lower and topmast stays formed? (Wire rope.)

3. State the numerals and symbols used in recording the force of wind, state of the weather, and form of clouds, in the journal or log.

4. Heave-to and discharge pilot, good working breeze.

5. Under all drawing sail, wind on starboard quarter, round-to on the port tack under single-reefed topsails.

6. Send down lower yards.

7. Sailing-vessels meeting, wind NE., one heading NW., the other ESE., which has the right of way?

II.

1. What are the duties of the officer of the gun-deck?

2. Describe the manner of measuring for rigging with a fore and aft draft and beam scale.

3. Make preparations for a hurricane (at sea).

4. Set all the starboard studding sails.

5. Close-hauled, starboard tack, moderate weather, change course four points to port, trim and make sail.

6. Send up and cross topsail yards.

7. Being officer of the deck of a steamer at night, you sight a red light four points on the starboard bow. What is the rule of the road governing both vessels?

III.

1. When and how is the log hove? who heaves it? and how is it noted?

2. State in what order the rigging goes over the foremast head.

3. You are in a cyclone in the North Atlantic, ship hove-to, wind east, blowing stronger, without changing its direction, what should you do?

4. Ship close-hauled, take one reef in the topsails.

5. Make preparations for sea, call all hands up anchor, and see officers and men at their stations.

6. How do you furl sails? (loosed to a bowline).

7. Steamers meeting, one steering SW., the other W. by N., which has the right of way?

IV.

1. State in general terms the outline of a fire-bill and what is done on the alarm of fire.

2. State the difference, if any, between the rigging of the fore, main, and mizzen-mast heads.

3. Believing your ship to be in a cyclone in the South Atlantic, ship hove-to; you have the wind SE., then S., how would you proceed?

4. Wear ship, moderate breeze.

5. Close-hauled on starboard tack, you observe a squall on starboard bow, how will you proceed?

6. Shift main topsail.

7. Sailing-vessels meeting, wind S. by W., one steering N. by E., the other NNE. which has the right of way?

V.

1. What are clothes-lists, when and how are they made out, and who keeps them?

2. State in what order the rigging goes over the fore topmast head.

3. Believing your ship to be in a cyclone in the North Atlantic, ship hove-to, you have the wind SE., then S., how would you proceed?

4. Tack ship, good working breeze.

5. By the wind on the starboard tack, the wind comes out on the lee bow, what will you do?

6. Make preparations for and bend sails.

7. Steamers meeting, one heading north, the other east, which has the right of way?

VI.

1. What is a berthing bill, how is it made out, and how are the men distributed?
2. Why does the mizzen mast have one lower and one topmast stay?
3. What are the indications of a cyclone? How does the wind revolve in the northern and how in the southern hemisphere?
4. Turn out the reefs in the topsails.
5. Before the wind, studding sails both sides, change course eight points to starboard.
6. Make preparations for loosing sails to a bowline, and loose them.
7. Sailing-vessels meeting, wind north, one steering SE., the other SW., which has the right of way?

VII.

1. How is a ship's company messed? How many men are usually placed in a mess, and how are cooks to messes appointed?
2. In measuring for standing rigging, how are the distances for eye-seizings and nips for dead-eyes ascertained?
3. Under sail close-hauled, how would you get a cast of the lead in about twenty fathoms of water?
4. Take in all starboard studding sails, breeze freshening.
5. How do you wear ship, blowing fresh, heavy sea?
6. By the wind, weather main-brace parts, how proceed?
7. Sailing-vessels meeting, wind N. by E., one steering S., the other S. by E. which has the right of way?

VIII.

1. Name the different day and the different night *lookouts*. What men are stationed, to take these several lookouts?
2. Describe dead-eyes for setting up wire rigging.
3. As officer of the deck of a steamer, how would you get a cast of the lead in about thirty fathoms of water?
4. How do you close-reef the topsails?
5. Stand in, on a wind, under all plain sail, and anchor.
6. Cross topgallant and royal yards and bend the gear.
7. Being officer of the deck of a steamer at night, you sight a vessel showing masthead and side-lights right ahead, what is the rule of the road to avoid collision?

IX.

1. Into how many watches are the men divided? Name them. What is the necessity for dog-watches? Who musters the watch, and how and when is it done?
2. Describe in general terms the method of cutting and fitting wire rope.
3. How would you inspect a life-boat at sun-down and report her ready for service?
4. Set studding sails both sides.
5. How do you box-haul? When is it resorted to?
6. A steamer meeting a sailing-vessel, wind N., steamer steering NE., sailing-vessel SW., how should both vessels be handled to avoid collision?

X.

1. What are the duties of the officer of the forecastle?
2. State in general terms how wire rope is made.
3. In reference to other ships, shoals, or any danger, how should a ship's head be cast in getting under way? why?
4. Fresh breeze, plain sail to royals, before the wind, bring by the wind on the port tack.
5. Riding head to wind and tide, get underway, cast to port, and stand out on a wind.
6. Send down topgallant and royal yards.
7. What is done by vessels at anchor in a fog? Where do vessels usually anchor in a harbor to avoid collision?

NAVAL ARCHITECTURE.

ANNUAL EXAMINATION.

JUNE, 1876.—*Time allowed, five hours.*

1. What is buoyancy, and on what principle does it depend? Define stability, and show on what it depends. What is the *metacentre?* What is a fair *metacentre* height for an ordinary ship? How is easy rolling insured, and how is the principle applied to modern-built vessels?

2. Give the three rules for working out areas of plane figures. How are volumes of solids measured? Deduce formula for Simpson's second rule.

3. Name and describe the plans commonly used in designing vessels. How is the displacement of a ship computed? How is the centre of buoyancy determined? State how the new centre of buoyancy is found after the ship is heeled, and deduce the formula for finding the metacentre. Define the coefficient of fineness.

4. How is the centre of buoyancy of a model found? Deduce formula for determining the centre of gravity of a vessel equipped for sea, and explain a practical method of making the calculations.

5. Give the rules for computing the registered tonnage of United States vessels, and describe the manner in which the measurements are taken. Show how the centre of effort of a ship's sails is found.

6. Deduce equations for statical and dynamical stability, and show on what the maximum angle at which a ship can safely heel depends.

7. State what is meant by design, and describe the principal lines used in designing a ship. Define augmented surface, and calculate it from the following data:

Mean of squares of sines of greatest obliquity	.0304
Mean of fourth powers of same	.0015
Length of load water-line	144 feet.
Length of mean immersed girth	19 "

Give rule for computing probable speed of a vessel.

8. State the principles of the wave-line theory. How is the length of entrance and of run found? What is the nature of the curves, and how are they constructed?

DEPARTMENT OF ORDNANCE AND GUNNERY.

ORDNANCE AND ARMOR.

SEMI-ANNUAL EXAMINATION.

JANUARY, 1876.—*Time allowed, four hours.*

1. Describe the process of casting hollow guns (Rodman's plan). Why cast hollow rather than solid?

2. Describe the method of obtaining tensile strength and specific gravity of metals.

3. Name the most improved guns in the American, English, and Prussian services, and state how they are constructed.

4. Give the weights of guns now in use in the United States service; also the weights of their projectiles.

5. How is the muzzle velocity of projectiles obtained? (Give the principle.)

6. Give the mode of fabrication of the Navy time-fuse and percussion-primer.

7. Give proportional ingredients of gunpowder, and state why it varies in size of grain, shape, density, &c.

8. Draw a profile of an earth-work; name the parts. Lay down the plan of a bastioned fort with four salients.

DEPARTMENT OF STEAM-ENGINEERING.

MARINE ENGINES.

ANNUAL EXAMINATION.

JUNE, 1876.—*Time allowed, five hours.*

1. Name the functions of a slide-valve in the order in which they occur. State at which edge of valve each is performed.

Define *steam-lap; exhaust-lap; angular advance;* and specify their effects severally upon the functions.

2. Two engines furnished the given diagram. In one the clearance, &c., was .086 of the cylinder-capacity; in the other .025. State the actual degree of expansion in both cases, and the proportion of work done in each with equal volumes of steam.

3. What ratio exists between capacities of cylinder and condenser in an ordinary marine engine, and what weight of steam can be condensed per square foot of tube-surface per hour in practice?

4. What should be the capacity of a single-acting air-pump as compared with the steam-cylinder, and how does it differ from a double-acting one?

5. The diagram given was taken on Lake Erie from the single-acting air-pump of a jet-condenser while the engine was developing 465000 foot-pounds per revolution. What per centum of the total work is absorbed by the air-pump; diameter of pump-piston 17 inches?

6. Name the resistances a vessel encounters after having attained uniform speed, and state their relative importance.

7. State how the horse-power required for propulsion is governed by the section, displacement, and speed of a ship.

8. With engines developing 14 horse-power per revolution, having a propeller of 12 feet diameter and 22 feet pitch, what will be the total effort in pounds exerted by the propeller at its centre of pressure, and what the useful component or thrust, assuming that there is no loss between cylinder and propelling-instrument from friction, &c.?

9. Knowing the thrust of a screw, how calculate its efficiency?

10. According to what dimensions of a screw, and how, does the slip vary?

11. An engine of 3 feet stroke is making 60 revolutions per minute, which drives the ship at the rate of 11 knots per hour; it is desired to run at 7 knots per hour. What must be the number of revolutions per minute to accomplish this?

12. An engine ran two trips of 92 hours each; the revolutions and mean effective piston-pressure were exactly alike in both cases. In the first trip, anthracite coal was used, and, in the second, bituminous; in all other respects, the conditions were precisely similar.

The total number of thermal units in one pound of anthracite coal is 15225; in bituminous, 14700. The consumption of the former was at the rate of 10 pounds per square foot of grate per hour; of the latter, 20 pounds. Compare the work done in each case at the conclusion of the run.

DEPARTMENT OF ASTRONOMY AND NAVIGATION.

NAVIGATION.

SEMI-ANNUAL EXAMINATION.

JANUARY, 1876.—*Time allowed, five hours.*

THEORY OF NAVIGATION.

1. How find, by inspection, the Mercator's course and distance between two places whose latitudes and longitudes are given, and also the middle latitude, course, and distance?

2. Define variation of the compass, dip, parallax, semi-diameter, and augmentation of the moon's horizontal semi-diameter.

3. Deduce formulas (by Napier's and Bowditch's rules) for solving the astronomical triangle: 1st, to find the azimuth and altitude of a heavenly body, when its declination and hour-angle and the latitude of the observer are known; 2d, to find the latitude of the observer when the body's declination, hour-angle, and altitude are known.

4. Find formulas for the azimuth and for the hour-angle of a heavenly body when the three sides of the triangle are known.

5. Deduce the *versin* formulas for altitude and for latitude.

6. Deduce the formulas for the ordinary reduction to the meridian, the altitude being taken near the meridian.

7. Find the error in the latitude of an observer due to an error in the altitude, and also to an error in the hour-angle.

8. Find the error in the hour-angle due to an error in the altitude (Prestel), and also to an error in the declination (equal altitudes). In this last case, having found the amount of the error of the hour-angle on a particular day, how proceed to find the error of the chronometer on Greenwich mean time? Give a reason for the sign of application of the equation of time to the chronometer-time of apparent noon.

9. How convert sidereal time at any place into mean time? State one method in detail, and give reasons for the process.

10. Deduce formulas for finding the amplitude and hour-angle of a body when in the horizon, and for finding the hour-angle when the body is nearest to or on the prime-vertical at a given place.

THEORY AND PRACTICE OF NAVIGATION AND SURVEYING.

ANNUAL EXAMINATION.

JUNE, 1876.—*Time allowed, five hours.*

1. How adjust a transit-instrument very nearly in the meridian? How determine the collimation-constant?

2. Deduce the general formula for the "reduction to the meridian", illustrating by figure, and thence deduce Bessel's formula for computing the correction to be added to the observed sidereal clock-time of transit of a celestial body over the middle thread to obtain the clock-time of transit over the meridian.

3. In chart projections, what is the polyconic method? Describe the method of projecting a map of large extent on polyconic principles. What are x and y in the tables? State the advantages and disadvantages of the polyconic projection.

4. Describe the method of determining the astronomical bearing of a line of a survey, the sextant being used. Describe the method of running a line of soundings. Give two methods of fixing the position of a rock or shoal, and placing it upon the chart.

5. What are semicircular and quadrantal deviations of the compass, and to what causes are they due? Explain the causes of change in deviation of a ship's compass upon a change of geographical position. Which coefficients are affected by a change in geographical position? Which are not, and why are they not?

6. Describe fully the causes of the heeling error in iron ships, and state the positions of a ship with regard to the magnetic meridian in which the error will be greatest and least.

7. Required the deviation of the ship's compass for the ship's head on each of the points given in the second column of the appended table; also the deviations (approximately) when the ship's head is, by compass, at north and northeast by east.

Watch-hours—		Ship's head by standard compass.	Simultaneous bearings of—		
On board.	On shore.		Theodolite on shore by standard compass.	Compass on board by theodolite.	Reading of theodolite pointed along zero-line, 198° 58′
4*h*. 32*m*. 0*s*. &c.	4*h*. 32*m*. 0*s*. &c.	N. N. E	S. 43° 45′ W.	142° 53′	
		E. N. E	S. 20° 15′ W.	124° 38′	
		E. S. E	S. 22° 0′ W.	131° 21′	
		S. S. E	S. 2° 30′ W.	106° 16′	
		S. S. W	S. 27° 0′ W.	124° 58′	
		W. S. W	S. 29° 45′ W.	122° 0′	
		W. N. W	S. 66° 30′ W.	153° 18′	
		N. N. W	S. 88° 15′ W.	181° 9′	

8. In question 7, the variation being 16° 32′ westerly, what is the true course made when the ship's head, by compass, is N. by E.? W. by S.? How head the ship, by compass, to make true course N. by E.? W. by S.? A light-house bears, by compass, N. 43° 30′ E., the ship's head being, by compass, S. by W. ½ W.; what is the true bearing of the light-house?

Answers to questions 7 and 8 required in degrees and minutes.

DEPARTMENT OF PHYSICS AND CHEMISTRY.

HEAT AND LIGHT.

SEMI-ANNUAL EXAMINATION.

JANUARY, 1876.—*Time allowed, five hours.*

1. What is meant by absolute temperature, and how does the use of absolute temperatures simplify the application of the laws of Boyle and Charles? Illustrate by an example.

2. What are the different methods used to measure quantities of heat?

3. What will be the result of mixing 5 kilogrammes of ice at 0° C., 1 kilogramme of water at 60° C., and ½ kilogramme of steam at 100° C.?

4. Discuss the isothermals of steam and water between the temperatures 180° F. and 212° F., the pressure changing from ½ atmosphere to 1 atmosphere.

5. Explain the reverse action of Carnot's engine, and show why it is impossible to transfer heat from a cold body to a hot one without the expenditure of mechanical work.

6. From the diagram deduce the four thermo-dynamic relations. (Diagram, p. 164, Maxwell's Theory of Heat.)

7. Derive a formula for determining heights by the barometer.

8. Explain the relations of the radiating and absorbing powers of solids and incandescent vapors.

9. What is the theory of the pressure of a gas?

10. Explain, by the molecular theory, the laws of Boyle and Charles.

11. What is meant by the angle of deviation produced in a ray of light by a prism? How is it used to determine the index of refraction?

12. Under what conditions are the dark lines of the solar spectrum visible? Explain the cause which produces them.

DEPARTMENT OF ENGLISH STUDIES, HISTORY, AND LAW.

LAW.

ANNUAL EXAMINATION.

JUNE 16, 1876.—*Time allowed, five hours.*

[Starred (*) questions are alternatives.]

CONSTITUTION OF THE UNITED STATES.

1. With whom rests the power of impeachment? the power of trying impeachments? the power of trying cases of admiralty jurisdiction? of determining the rules of proceeding in either house of Congress? of originating bills for raising revenue? of defining and punishing offences against the law of nations? of appointing consuls? of admitting new States into the Union?

2. Describe the process by which a bill becomes a law.

State the provision in the Constitution in regard to (1) tonnage-duties; (2) export-duties; (3) unreasonable searches and general warrants; (4) religious tests.

INTERNATIONAL LAW.

3. Define or explain:—Natural law, right of redress, right of postliminy, embargo, reprisal, paper blockade.

Name and describe the ship's papers required by both international and municipal law.

3*. "International law knows only governments *de facto*." Explain.

Discuss the right of a state to the navigation of a river whose headwaters only lie within its territory.

4. Explain the relation of aliens to the government of the country in which they are sojourning.

State the rule as to the exemption of an ambassador from civil jurisdiction.

4*. Give a detailed account of the negotiations conducted by the United States Government in reference to the article of the Paris declaration (1856) on privateering, first through Secretary Marcy, and afterwards at the beginning of the late war.

5. What is the present usage of belligerents in regard to the treatment of irregular soldiers? of non-combatants? of private property? of public property? What is the usage as to requisitions?

5*. What is piracy? Where may pirates be tried? Distinguish between piracy by international law and acts which are made piracy by statute.

6. Discuss the limits of the right of search in the case of neutrals under (1) belligerent convoy, (2) neutral convoy.

6*. What is due notice of a blockade? What is the penalty for a breach of blockade? How far was the doctrine of continuous voyages applied by our courts during the late war to breaches of blockade?

7. What, in general, is a competent court for determining a question of prize? What courts have cognizance of these questions in Great Britain? in the United States? What can you say of the place of the court?

7*. Explain contraband.

Discuss the principle of "occasional contraband". Explain the practice of pre-emption as applied to contraband goods.

8. In case of a war between the United States and France, in command of the United States ship Constellation cruising in the West Indies, you recapture an American brig, having on board a prize-crew, from her captor, the Insurgente, and bound to

Martinique for adjudication. Describe all the consequences of the recapture, stating what you do with the prize, and what becomes of her finally; in general, how all parties are affected, giving reasons.

9. Some days later, you capture a barque owned in Bahia, and engaged in carrying contraband to France. She is taken into port and condemned on that ground. It appears that she was originally an American vessel, but was captured early in the war by the French, condemned as enemy's property, and sold to a Brazilian firm. The original owner puts in a claim. How is it to be decided?

10. Next day you search a Dutch (neutral) brig, bound from Guadaloupe to Copenhagen. You discover a packet addressed to the French ambassador at Copenhagen, from the governor of the island. The master does not voluntarily disclose the packet, nor does he practise any fraud. What would you do? What consequences would flow from your act?

CADET-ENGINEERS.

FIRST CLASS.

DEPARTMENT OF STEAM-ENGINEERING.

MARINE ENGINES.

ANNUAL EXAMINATION.

JUNE, 1876.—*Time allowed, four hours.*

1. Give the formulas for direct crushing: for crushing by bending, as in the cases of a connecting-rod and of a piston-rod. Explain manner of using, and give values of constants.

2. What will be the safe working-pressure of a boiler (cylindrical) of the following dimensions; diameter, 4′; length, 16′; thickness of shell, $\frac{5}{16}''$; seams double-riveted? Through this boiler passes an elliptical flue $36'' \times 15'' \times \frac{5}{16}''$, and of the same length as the boiler. What pressure will it stand with safety, and how and where can it be made equally strong with the shell?

3. Discuss the subject of spherical shells as applied to the ends of cylindrical boilers, tops of steam-domes, &c.

4. Discuss the subject of chimney-draught, giving formulas for velocity of current, density of mixed gases, and head required to produce the draught.

5. Given anthracite coal of the components C, 0.915; H, 0.035; and O, 0.026: required the weight of pure carbon whose total heat of combustion shall equal that of the fuel, the theoretical evaporative power in pounds of water from and at 212° Fah., and the number of pounds of air required for combustion per pound of fuel.

6. Define efficiency of heating-surface. Assuming Peclet's formula for the thermal resistance of the plates, viz: $q = A(T-t)\left\{1 + B(T-t)\right\}$, find an expression for the efficiency from the following data:

W, weight of gas given out by the furnace per hour;

c', its specific heat at constant pressure;

T, its temperature, whose value is T_1 at first contact and T_2 at last;

t, temperature of the water in the boiler;

ds, area of surface in contact with the fluids $\left(\int ds = S\right)$;

q, rate of conduction per square foot per hour; and

$\frac{S}{c'W} = \int_{T_2}^{T_1} \frac{dT}{p}$, the equation of reference.

7. What is a calorimeter? Describe different kinds in general use.

8. What relation exists between the pressure and density of vapors? What formula is used for calculating the pressure from the temperature of the boiling-point?

9. Define specific heat. The specific heat of water at any temperature T being given by the formula $c = 1 + 0.000000309\,(T - 39°.1)^2$, it is required to find the *mean* specific heat between any given pair of temperatures T_1 and T_2.

10. What is meant by absolute zero? How is it determined? Find the absolute temperatures of melting ice, and of water boiling under the pressure of one atmosphere in the Réamur, Centigrade, and Fahrenheit scales.

DESIGNING MACHINERY.

ANNUAL EXAMINATION.

JUNE, 1876.—*Time allowed, five hours.*

1. Give the lengths, in feet, of the fore and the after body of a steam-vessel whose speed is to be 14 knots per hour.

2. Give the indicated horse-power for a vessel, according to Rankin's method, from the following data:

Mean of squares of sines of angles of greatest obliquity	0.0252
Mean of 4th powers of sines of angles of greatest obliquity	0.0008
Length on water-line	300 feet.
Length of mean immersed girth	40 feet.
Speed, in knots	17
Coefficient of propulsion	21802

3. The space in clearance and passages being 8 per centum of the space displacement of the piston, give a formula that will express the measure of expansion actually effected, the point of cutting off being half-stroke.

4. Give the diameters of the two cylinders for a compound engine of 1000 indicated horse-power. Data: stroke, 3 feet; revolutions per minute, 50; boiler-pressure per square inch (absolute), 78 pounds; back pressure, 3 pounds per square inch; total measure of expansion, 8.

5. Given diameter of cylinder 60 inches, stroke 36 inches, revolutions per minute 50, what should be the width of the steam-ports, their length being 46 inches? What should be the width of the exhaust-port?

6. Discuss the Zeuner valve diagram in its application to the action of the simple slide-valve. Give an example showing how the lap and travel of the valve can be ascertained when the point of cutting off and angle of bed are known.

7. Design a gridiron expansion-valve: the ports of the main valve to be 4 inches wide; the cut-off valve to have *two* ports, and the openings in the valve to be $\frac{1}{2}$ inch wider than those in the seat; to cut off at $\frac{1}{4}$ stroke, and have no angular advance; the main valve to admit steam when the piston is $\frac{1}{2}$ inch from the beginning of its stroke. What should be the travel of the cut-off valve, and what amount of steam-lap should be placed on the main valve to prevent a re-admission of steam before the stroke is completed?

Give also the minimum distance between the ports of the cut-off valve. Make stroke of piston 4 feet.

8. In question (7.) what must be the length of the cylinder?

9. Upon what does the breadth of the piston-ring face depend? How is the friction of the piston counteracted in horizontal engines? What should determine the employment of any remedy for excessive friction?

10. Give the thickness of a cylindrical boiler-shell, 10 feet in diameter, for a pressure of 80 pounds per square inch, per gauge. Give also the grate and heating surfaces, and the calorimeter, in square feet, required for the evaporation of 1000 pounds of water per hour.

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